Seed policy and programmes in the Near East and North Africa

ISSN 0259-2517

FAO
PLANT
PRODUCTION
AND PROTECTION
PAPER

159

Food
and
Agriculture
Organization
of
the
United
Nations

Seed policy and programmes in the Near East and North Africa

FAO
PLANT
PRODUCTION
AND PROTECTION
PAPER

159

Proceedings of the Regional Technical Meeting on Seed Policy and Programmes in the Near East and North Africa

Larnaca, Cyprus, 27 June-2 July 1999

Seed and Plant Genetic Resources Service
Plant Production and Protection Division

Food
and
Agriculture
Organization
of
the
United
Nations

Rome, 2000

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

ISBN 92-5-104473-2

All rights reserved. Reproduction and dissemination of material in this information product for educational or other non-commercial purposes are authorized without any prior written permission from the copyright holders provided the source is fully acknowledged. Reproduction of material in this information product for resale or other commercial purposes is prohibited without written permission of the copyright holders. Applications for such permission should be addressed to the Chief, Publishing and Multimedia Service, Information Division, FAO, Viale delle Terme di Caracalla, 00100 Rome, Italy or by e-mail to copyright@fao.org

© FAO 2000

Copyrighted material

TABLE OF CONTENTS

PREFACE ---------- v

ACKNOWLEDGEMENTS ---------- vi

LIST OF ACRONYMS AND ABBREVIATIONS ---------- vii

REPORT OF THE TECHNICAL MEETING ON SEED POLICIES AND PROGRAMMES IN THE NEAR EAST AND NORTH AFRICA (ARABIC VERSION IN APPENDIX 2) ---------- 1

OPENING ADDRESS
H.E Mr. Costas Themistocleous, The Minister of Agriculture and Natural Resources ---------- 23

INTRODUCTORY REMARKS
Mahmud Duwayri ---------- 25

PRESENTED PAPERS

SEED PRODUCTION AND IMPROVEMENT: ASSESSMENT FOR THE NEAR EAST AND NORTH AFRICA
Seed and Plant Genetic Resources Service, FAO ---------- 27

MANAGEMENT, CONSERVATION AND UTILIZATION OF PLANT GENETIC DIVERSITY IN THE NENA REGION.
Mohammad Taeb ---------- 81

NATIONAL SEED POLICY AND STRATEGIES FOR THE NEAR EAST AND NORTH AFRICA
A.J.G van Gastel, and B.R. Gregg ---------- 103

PRIVATISATION OF THE SEED SECTOR IN THE NEAR EAST AND NORTH AFRICA
M. Turner, S. Kugbel, and Z. Bishaw ---------- 125

REGIONAL AND SUB-REGIONAL COOPERATION IN THE SEED SECTOR IN THE NEAR EAST AND NORTH AFRICA.
Prof. A. A. Abdalla ---------- 137

SEED LEGISLATION AND REGULATION MEASURES IN THE NEAR EAST AND NORTH AFRICA
A. Hadjichristodoulou ---------- 143

IMPROVED SEED PRODUCTION AND TECHNOLOGY TRANSFER TO FARMERS IN THE NENA REGION
A. Muhammed ---------- 151

ASSESSMENT OF VEGETABLE SEED PRODUCTION AND SUPPLY IN THE NEAR EAST AND NORTH AFRICA REGION
Ayman Abou-Hadid ---------- 165

This One
6037-6R1-4ZP1

FORAGE AND PASTURE SEED PRODUCTION AND SUPPLY IN THE NEAR EAST AND NORTH AFRICA
Mohammed Tazi----------183

OECD SCHEMES FOR THE VARIETAL CERTIFICATION OF SEED MOVING IN INTERNATIONAL TRADE
B. Dagallier----------197

APPENDIX 1 - LIST OF PARTICIPANTS----------203

APPENDIX 2 - REPORT OF THE MEETING (ARABIC VERSION) ----------207

Copyright ...

PREFACE

The development of a strong seed industry is crucial to improve the delivery of good quality seed to farmers and the development of agriculture in the Near East and North Africa. In any discussion of agricultural development strategies, the subject of seed has a unique capacity to draw attention and interest. Seed is the primordial input, the embodiment of past harvests and the promise of future ones. It is not surprising that seed is a prominent feature of many proposals for programmes and projects concerned with improving the productivity of limited-resource farmers. In addition, efforts to strengthen the private sector in developing country agriculture often target the seed industry. Unfortunately, these various seed initiatives have had relatively little impact on the majority of resource-poor farmers.

The growth of the private seed sector, which is critical to the development of the seed industry in the Near East and North Africa, would require the establishment of enabling environment. This would include the establishment of effective seed legislation, especially provisions for intellectual property rights and seed quality control. In this sense, governments will need assistance in the development and implementation of their seed rules and regulations. In addition, due to the potential threat that modern crop improvement presents to crop genetic resources, which has been recognized by countries in the region, assistance in germplasm conservation practices to safeguard adapted local and improved varieties is also critical in the development of seed sector in the region. In this regard, a regional seed advisory body would be needed to guide seed-related assistance at the regional, sub-regional and national levels in the Near East and North Africa. This body would also advise on the proper and effective ways to involve the private sector in the efforts to strengthen the seed industry in the region.

It is abundantly clear throughout the Near East and North Africa region that decision-makers are attaching great importance to strengthening the seed sector as a means to improving the food security situation in their respective countries. They are equally daunted by the complexity of the subject. More importantly, they are increasingly cognisant of the fact that policy decisions on privatization, pricing, incentives and subsidies and other measures affect directly the development of the seed sector.

FAO traditionally has been instrumental in the technical and professional development of the seed systems in the countries of Near East and North Africa. Now, they are in turn looking for FAO assistance in developing strategies, policies and programmes for the advancement of this very important sector.

ACKNOWLEDGEMENTS

The Seed and Plant Genetic Resources Service of the Food and Agriculture Organization of the United Nations is greatly indebted to the Government of Cyprus for kindly accepting to host this regional technical meeting on Seed Policy and Programmes for the Near East and North Africa. We are especially grateful to the Agricultural Research Institute of the Ministry of Agriculture, Natural Resources and Environment of Cyprus and the National Organizing Committee for their competence in the organization of the meeting.

Finally, we sincerely thank all the participants, especially those from the Near East and North Africa, resource persons, international organizations, government and non-governmental organizations, and the private seed companies and associations, which responded to the invitation to attend this meeting.

U.G. Menini
Chief, Seed and Plant Genetic Resources Service
Plant Production and Protection Division
FAO, Rome

LIST OF ACRONYMS AND ABBREVIATIONS

AARINENA	Association of Agriculture Research Institutions in the Near East and North Africa
ACSAD	Arab Center for the Studies of Arid Zones and Dry Lands
AGP	Plant Production and Protection Division (FAO)
AGPS	Seed and Plant Genetic Resources Service (FAO)
AREEO	Agricultural Research, Education and Extension Organization (Iran)
AREA	Agricultural Research and Extension Authority (Yemen)
ARI	Agricultural Research Institute (Lebanon)
ASSINSEL	International Association of Plant Breeders for the Protection of Plant Varieties
CBD	Convention on Biological Diversity
CFS-NENA	Consultative Forum on Seed in the Near East and North Africa
CGIAR	Consultative Group for International Agricultural Research
CIAT	International Center for Tropical Agriculture (CGIAR)
CIMMYT	International Maize and Wheat Improvement Center (CGIAR)
CIP	International Potato Center (CGIAR)
CITES	Convention on International Trade in Endangered Species
CPE	coefficient of protection effort
DNA	desoxyribonucleic acid
DUS	Distinctiness Uniformity and Stability
ESAS	Egyptian Seed Association
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FFL	farmer first and last
FIS	Féderation Internationale du Commerce des Semences
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GNP	Gross National Product
GPA	Global Plan of Action
GNIS	Groupement National Interprofessionnel des Semences et Plants (France)
GOSM	General Organization for Seed Multiplication (Syria)
GTZ	German Agency for Technical Cooperation
IARC	International Agricultural Research Center
ICARDA	International Center for Agricultural Research in Dry Areas (CGIAR)
ICRISAT	International Crop Research Institute (CGIAR)
IFAD	International Fund for Agriculture and Development
IITA	International Institute for Tropical Agriculture (CGIAR)
IPGRI	International Plant Genetic Resource Institute (CGIAR)
IPPC	International Plant Protection Committee
IPR	Intellectual Property Rights
INRAT	Institut National des Recherches Agronomiques de Tunisie
IRRI	International Rice Research Institute (CGIAR)
ISNAR	International Service for National Agricultural Research
ISTA	International Seed Testing Association
LIFDC	low-income food-deficit countries
MSSP	Multisectors Support Programs (Egypt)
NARS	National Agriculture Research System
NENA	Near East and North Africa
NGO	Non-Governmental Organization
OCBS	Office des Céréales et des Betteraves Sucrières (Lebanon)
OECD	Organization for Economic Co-operation and Development
PBR	Plant Breeders Rights

Copyrighted material

PGR	Plant Genetic Resources
PGRFA	Plant Genetic Resources for Food and Agriculture
PIC	prior informed consent
PVP	plant variety protection
RPF	resource poor farmers
SIDP	Seed Improvement and Development Programme
SONACOS	Société Nationale de Commercialisation des Semences (Morocco)
SPC	Seed Production Center (Cyprus)
SRCC	Seed Registration and Certification Center (Turkey)
SSASI	Sub-Saharan Africa Seed Initiative
TOT	transfer of technology
TRIPS	Trade Related aspects of Intellectual Property Rights
UAE	United Arab Emirates
UNDP	United Nations Development Programme
UNDRO	Office of the United Nations Disaster Relief Co-ordinator
UNHCR	United Nations High Commission for Refugees
UNIDO	United Nations Industrial Development Organization
UPOV	International Union for the Protection of New Varieties of Plants
USA	United States of America
USAID	United States Agency for International Development
VCCS	Village Cooperative Credit Society (Cyprus)
VCU	value for cultivation use
WANA	West Asia and North Africa
WANANET	West Asia and North Africa Plant Genetic Resources Network
WFP	World Food Programme
WIPO	World Intellectual Property Organization
WIEWS	World Information and Early Warning System
WTO	World Trade Organization

Copyrighted material

REPORT OF THE TECHNICAL MEETING ON SEED POLICY AND PROGRAMMES IN THE NEAR EAST AND NORTH AFRICA

LARNACA, CYPRUS
27 June - 2 July 1999

1. INTRODUCTION

The Meeting was organised by the Agricultural Research Institute in Nicosia, Cyprus in close collaboration with the Food and Agriculture Organization of the United Nations (FAO). It was held in Larnaca from 27 June to 2 July 1999. The meeting was convened under the FAO's mandate to facilitate the implementation of the Global Plan of Action for the Conservation and Utilisation of Plant Genetic Resources for Food and Agriculture, adopted by the International Technical Conference on Plant Genetic Resources held in 1996 and in line with the recommendations of the World Food Summit.

Government designated participants attended from the following Near East and North African (NENA) countries: Cyprus, Djibouti, Egypt, Iran, Iraq, Jordan, Lebanon, Libya, Morocco, Oman, Pakistan, Sudan, United Arab Emirates and Yemen. Participants from international organisations, international agricultural research centres, governmental and non-governmental organisations, and public and private sector organisations involved in the seed industry also attended the meeting. Other participants attended the meeting as observers and on their own capacity.

The Meeting was opened by Mr. P. Aristotelous, Deputy Director General, Ministry of Agriculture, Natural Resources and Environment on behalf of His Excellency Mr. Costas Themistocleous, Minister of Agriculture, Natural Resources and Environment of Cyprus. This opening speech followed the keynote address of Dr. Mahmud Duwayri, Director of the Plant Production and Protection Division on behalf of the Food and Agriculture Organization of the United Nations.

The objectives of the Meeting were to:

- Develop appropriate policies concerning governmental, commercial and small-scale enterprises in seed production and seed distribution, designed to enhance efforts of government-supported initiatives on the variety needs of small-holder farmers in particular, with special attention to the needs of women farmers;

- Provide, and promote as appropriate, an enabling environment, where such an environment does not already exist, for the development of small-scale seed enterprises;

- Strengthen linkages between genebanks, plant breeding organisations, seed producers, and small-scale seed production and distribution enterprises;

- Consider seed quality control schemes particularly those appropriate to small-scale enterprises; and

- Consider legislative measures, which allow distribution and commercialisation of landraces and farmers' varieties and obsolete varieties, if they meet the same distribution and commercialisation criteria for disease, pests, health and the environment, as conventional or registered varieties.

2. THE MEETING

To establish a framework for discussion at the meeting, a reference document was prepared by the FAO. This was supplemented with several technical thematic papers on the development of policies and programmes designed to achieve a sustainable supply of crop seeds and crop genetic resources for food and agriculture in the NENA region. The following sections give a brief summary of each paper presented and highlight important features of the discussion following each presentation:

2.1 Seed Production and Improvement Assessment for the Near East and North Africa

The reference document was prepared by the Seed and Plant Genetic Resources Service (AGPS) of the Plant Production and Protection Division (AGP) of FAO and was based on contributions provided by Member Governments and information from relevant workshops and meetings. The document briefly reviews the agro-ecological and socio-economic setting in the region as well as its overall agricultural development, which shows a heavy reliance on food import, making the NENA region the largest food-importing region in the developing world. Among the many contributing factors to this situation is a shortage in supply of improved seeds for major crops.

The status of the formal seed supply system in the region varies from one country to another. Only a few countries can claim to have a well-developed formal seed sector with good infrastructure, seed laws and certification system as well as variety evaluation procedures. While physical and technical constraints contribute to these factors, it is increasingly clear that many of the weaknesses in the seed sector in the NENA region are due in part to policy and management-related factors and socio-economic issues. The paper emphasises the paramount importance of creating conditions conducive to balanced development of the formal and informal seed supply systems. In doing so, governments need to recognise the importance of the informal seed systems and introduce policies and necessary actions to stimulate their growth. The paper then puts forward wide-ranging proposals, which could provide a basis for national plans of action in accordance with the specific conditions and needs of each country.

The paper concludes by stressing the need for better co-ordination and harmonisation of national, regional and international efforts to enhance the seed industry in the region. It proposes the formation of a consultative body to assist countries in the region and to mobilise resources.

In the ensuing discussion, participants made the following points:

- Appropriate attention should also be given to research in seed and planting material production in floriculture and fruit trees.
- Training in seed technology, including training of farmers, is needed in the region.
- There is a need to establish a Consultative Forum as an appropriate means to address the complex issues raised by the paper. The participants stressed that the role of member countries and organisations and the expected output of the Consultative Forum must be defined.
- There is an urgent need to establish a seed unit in every agricultural research centre/main station responsible for interfacing with farmers.
- Many countries in the region need help to set up national seed policies that correspond with their priorities and to mobilise resources.
- The meeting realised that there is a need to establish bi-lateral and multi-lateral projects to work together in the region. In this regard, several countries, in particular Iran, expressed a willingness to collaborate on this approach when necessary.
- There is a lack of information exchange and a strong need to share basic information.
- The quality of information presented in the reference document for the purpose of the meeting was praised.

Copyrighted material

2.2 Privatisation of the Seed Sector in the Near East and North Africa

During the 1980s, the role of the private sector in developing countries received greater attention. Governments were encouraged to withdraw from direct involvement in production and marketing and to concentrate on policy matters. Because it is a 'commercial' activity, seed supply was included in the privatisation process. However, despite the strategic importance of seeds in agriculture, it is difficult to establish a viable business based on seed supply. Therefore, the privatisation process requires active and careful management by government.

In order to encourage greater private sector activity, it is first necessary to reconsider regulatory barriers and subsidies so that there is a 'level playing field' for all participants in the seed sector. It is also possible to offer indirect support through quality assurance services and some financial incentives. However, even with a favourable policy environment, seeds of some crops are intrinsically difficult to commercialise, including some important staple food crops (cereal and legume) of the NENA region.

Multinational companies may enter the seed sector. However, they are highly selective in terms of crops and agricultural areas. In practice, only communities located in the most favourable areas are likely to benefit from their activities. It is therefore important that indigenous private seed companies evolve. Small seed enterprises, which have lower capital and management costs, may play an important role in the development of the seed supply sector, if they are supported in the establishment phase. As the seed sector becomes more diverse, it is important to have a national forum in which different interests are represented. The establishment of national seed associations may act as a positive factor in supporting the emerging private sector and representing its interests to government.

The paper concludes by stressing that there is a continuing role for government to maintain a favourable policy environment so that the private sector can benefit from all commercially viable parts of the seed market. Furthermore, other aspects of the seed supply system may require a more active input by government if all farmers are to benefit from new varieties and improved seed.

In the ensuing discussion, participants made the following points:

- The progress of privatisation varies widely in the region. The region should be creative in encouraging involvement of the private sector in seed supply systems.
- There is a need to promote local entrepreneurship, which requires training at all levels.
- There was a concern regarding responsibility for preserving genetic diversity. It was also proposed that germplasm of commercial varieties and progenitors should be preserved.
- It is necessary to find ways to involve the private sector in seed certification. It was proposed that, while quality assurance should be the responsibility of the government, in the medium term private companies should consider introducing internal quality assurance schemes. The need for training in quality assurance was also expressed.
- The need to involve qualified international and local NGOs in the seed sector was re-emphasised.
- There was concern about emphasising efficiency considerations at the expense of equity, causing resource-limited farmers to be less well served in the future.

2.3 Management, Conservation and Utilisation of Plant Genetic Diversity in the Near East and North Africa

Sustainable utilisation of plant genetic resources is an essential component in increasing the efficiency of resources utilised for food production. Reliance of the breeders in the region on material provided by international centres has resulted in a reluctance to utilise indigenous genetic resources of the region. As a result, conservation of these resources has suffered and despite the genetically diverse flora in the region, only a small fraction of this plant genetic diversity is being conserved. This is being done under unsatisfactory conditions with inadequate information. There are large differences among countries of the region in their efforts for conservation and utilisation of plant genetic diversity and often there is not a proportionate balance in conservation vs. utilisation capacity. It is estimated that there are more than three hundred crop species and varieties, which are not taken care of by breeders in the region, and that these are maintained by farmers as landraces. To support the development of a sound seed industry through sustainable utilisation of plant genetic resources, the following suggestions were made:

- Develop information on *ex situ* accessions maintained across the region by characterising and evaluating these accessions while taking into consideration breeding objectives.
- Collect genetic resources native to the countries of the region and identify gaps in existing collections.
- Promote co-operation in the field of plant genetic diversity within and outside of the region.
- Take appropriate measures in support of both conservation and utilisation of plant genetic diversity to correct the imbalance in capacities in conservation and utilisation of plant genetic diversity in countries of the region.
- Establish a forum to promote joint efforts in breeding among countries in the region.

In the ensuing discussion, participants made the following points:

- Both of the users - breeders and farmers - should preserve plant genetic resources. Plant breeders are involved in conservation but they only conserve materials that are useful to them.
- Minimisation of plant genetic erosion is of paramount importance in the region. Every action should be taken in this direction.
- In order to minimise costs, preservation in gene banks can be done in selected centres for the whole region. Policy makers in different countries in the region complained about the lack of use of genetic material kept in their facilities.
- Questions were raised about farmers' varieties and Farmer's Rights.
- The certification of farmers' varieties (landraces) should be possible, but their legal protection appears to be difficult.
- Ways and means to fund conservation activities including Farmers' Right should be found.

2.4 Improved Seed Production and Technology Transfer to Farmers in the NENA Region

Transfer of technology (TOT) to farmers is essential to ensure that farmers appreciate the crucial importance of using improved seed to achieve sustainable, higher crop yields. The stakeholders in the TOT process include agriculture credit organisations, including private banks who provide short and medium term loans to farmers, manufacturers and suppliers of agricultural machinery and inputs, the public and private sector seed industry, NGOs and farmers co-operatives. All of these stakeholders need up-to-date information on new varieties and sources of improved seed in order to advise their clients to make more efficient use of the credit and farm inputs.

The main responsibility for TOT lies with the agriculture extension departments within the provincial or state agriculture departments. A radical change in the approach to TOT, assigning a major role to the private sector and farmers' organisations, has not been attempted in any of the NENA countries. TOT by the research institutions to the farmers is an attractive approach, especially in situations where mono-commodity research institutions (e.g. Rice Research Institutes) have been developed on major crops. The private sector can be very effective in TOT, particularly if the information is backed by a supply of credit and inputs that can help translate improved technology into actual on-farm production. Research in seed science *per se*, which is almost non-existent in the NARS, needs to be emphasised. To increase the supply of quality seed, efforts should be made to support private sector seed production through appropriate incentives. Linkages to the informal seed sector should also be strengthened to increase the supply and use of improved seed.

Transfer of technology through the public sector extension agencies is generally not considered sufficiently effective. The role of these agencies should be more focussed and better defined, and the career structure of the extension staff should be improved and linked to higher achievements. There should also be better linkages between the research and extension organisations so that extension personnel are regularly updated about new technology. Mono-commodity research institutes should also undertake TOT as a part of their mandate and establish a two-way link with farmers. TOT by the private sector, particularly dealers in agricultural inputs, seed suppliers, NGOs and farmers co-operatives, is quite effective and can be further improved through better liaison with research institutes to obtain regular information.

In the ensuing discussion, participants made the following points:

- Much money is spent on developing new varieties, which are not properly utilised due to inadequate extension services. Some participants suggested that research stations and institutions could do a better job than the existing extension services in transferring knowledge to farmers.
- Commodity and location specific transfer of knowledge and technology can be more appropriate and effective than a general approach.
- Introducing seed science courses into the curricula of universities and other relevant teaching institutions will advance the transfer of knowledge.

2.5 Seed Legislation and Regulatory Measures in the Near East and North Africa

Seed legislation in the NENA countries generally does not cover all aspects of variety release, seed quality control, seed marketing and distribution. Furthermore, legislation has been satisfactory in a number of countries, but is practically absent in many others. In some countries, the importation of varieties of food crops is covered by legislation, especially on vegetables (grown under irrigation) and hybrid seed (corn, sunflower). There is a need for the formulation of processes controlling and facilitating free trade of seeds and also protecting and improving local seed exchange systems. In some countries, informal systems account for most of the seed supply.

Legislation on intellectual property rights and plant variety protection is almost completely lacking in the region. Introducing such legislation will promote investment as well as encourage progress on variety improvement as all the players concerned (farmers, scientists, and investors) will be protected.

In the case of grain and forage cereals, the main source of seed comes from farmers, which is supplemented by the national seed production systems. There are ways to introduce breeders' rights in the region to promote innovations and progress in developing improved varieties and at the same time to protect the rights of farmers. Following UPOV or the EU acceptable systems, small landowners (producing less than 100 tonnes of grain) should be allowed to reproduce their own seed of registered varieties though not allowed to trade seed.

The adoption of the TRIPS agreement along with registration of varieties, conservation of plant genetic resources, seed production and trade will improve access of farmers to improved varieties. Legislation developed in the EU and UPOV guidelines on protecting new varieties could be the basis for developing efficient seed production and distribution systems in the countries of NENA. However, certain features of the region, namely low productivity, small farms, low inputs, the need to protect farmers' rights and at the same time improve farmers access to new plant varieties, must be taken into consideration before introducing new legislation. FAO could assist countries to improve and complete their legislation by developing general principles, based on international agreements and the EU experiences, which could be adapted to the conditions of each country in the NENA region.

In the ensuing discussion, participants made the following points:

- Intellectual property rights and PVP legislation are necessary in order for plant breeding, seed production and trade to progress. When preparing regulations, governments should seek co-operation from the private sector, to minimise and/or more easily solve future problems.
- Government efforts must be intensified to increase the use of certified seed. However, because government funds are limited, it was agreed that the private sector should play a more active role (including inspection and testing of their seed) while the government can play a regulatory role.
- The need for assistance in testing cultivars and drafting new legislation was emphasised.
- The need for harmonisation of seed legislation and regulations was stressed. This is an area in which collaboration and mechanisms should be developed. Problems in harmonising seed laws were also discussed. Phytosanitary problems constitute major barriers to international seed trade.
- Assistance from international and regional organisations should have a positive effect on efforts to harmonise legislation.

2.6 Regional and Sub-regional Co-operation in the Seed Sector in NENA

High quality seed is critical to sustainable agricultural growth and food security. However, seed remains on the periphery of agricultural development in the NENA region. Seed supply systems are inefficient and weakly linked to the world seed industry. National seed supply systems are at different levels of development in terms of organisational structure, policies, regulations, certification technology, trained man power and germplasm management, and breeding and testing vary from rudimentary to strong. Farmers' participation in variety development, which is essential for adoption of improved varieties, is minimal. Major constraints to farmers' participation include weak generation of improved varieties, lower adoption levels of available improved varieties and lack of proper institutional links, in addition to inconsistent policies and regulations. Despite similarities in farming systems, economic policies and the potential for the development of several shared crops in the region, co-operation remains weak.

Improving regional co-operation may be achieved through:

- Strengthening methods of seed production including variety development, seed multiplication, processing, distribution and marketing.
- Harmonising seed legislation to facilitate seed production, regional trade and phytosanitary aspects of seed production.
- Harmonising of seed policies.
- Instituting seed associations at national, sub-regional and regional levels.

Possible institutional arrangements for co-operation include sub-regional and regional consultative fora. The seed sectors in the region should improve contacts with international organisations. Sub-regional associations, which are likely to be more functional, and will improve regional communication and collectively contribute to a stronger regional seed forum should be established.

In the ensuing discussion, participants made the following points:

- There is need for a model seed law to facilitate production and trade across the region. The law should facilitate the involvement of all sectors concerned.

- The harmonisation of seed legislation will require analysis of existing rules in different countries.
- The role of seed associations to exert pressure on governments and the need for co-operation was stressed. Regional and/or sub-regional fora should be more efficient in dealing with specific issues.
- In order to achieve harmonisation, an in-depth assessment of the situation in each country should be undertaken. FAO should help in this assessment. It was suggested that it would be useful to have an umbrella organisation to co-ordinate harmonisation activities.
- There is an urgent need to develop mechanisms to get proper attention of policy makers who are involved in decisions regarding harmonisation.
- Realistic national legislation is required for efficient regional co-operation.
- Development of human resources is urgently required in the area of seed science and related subjects.

2.7 Assessment of Vegetable Crop Seed Production and Supply in the Near East and North Africa

The importance of vegetable crops is evident, based on both the large acreage and high cash income generated from vegetables in comparison with other crops. However, productivity of vegetable crops is highly variable among countries in the region due to the low quality of seed or the use of cultivars that were bred for other climatic zones. This confirms the importance of using high quality seeds of varieties specifically developed for the region. In general, there was a dearth of information on vegetable seed production and supply in the region. While many of the local varieties and cultivars are lower in productivity in comparison with imported hybrids, they may have special taste, disease resistance and/or tolerance to abiotic stresses. Efforts to improve local varieties could result in higher yield while maintaining the adaptability to local conditions.

The constraints facing seed production in the region include: a) lack of required financial support for researchers working in the production of breeder seed; b) severe deficit in technical personnel to support successful breeding programmes; c) lack of tools and equipment required for the production of seeds and proper storage facilities; d) difficulty in exchanging plant materials between countries; and e) an absence of standardised breeding fields resulting in the production of low quality seed.

Only a few countries in the region have concrete plans for strengthening the vegetable seed sector. Most countries were slow in establishing national gene banks and/or central facilities for plant genetic resource collections. It is only in recent years that some of the countries have established such facilities or started to do so. The participation of the domestic private sector in vegetable seed industries was seriously limited in the last decades. Private enterprises should be encouraged to take the lead in vegetable seed production, preferably in collaboration with other private or public institutions. It is also necessary to improve local and regional breeding programmes.

In the ensuing discussion, participants made the following points:

- Participation of the private sector is vital to vegetable crops and seed production.
- Competition from imported seeds dictates the need for joint ventures.
- Registration of varieties from the private sector must be facilitated. However, the private sector must supply the necessary documentation, such as a variety description and other technical information.
- In vegetable production, the quality of seed is critical to crop yield and produce quality.

2.8 Forage and Pasture Seed Production and Supply in Near East and North Africa

The extent of permanent pastures, cultivated forage land and rangeland indicates a reasonable potential for livestock production in the Near East and North Africa. However, the success of range improvement programmes and forage production operations depends on several factors, among which is the availability of sufficient quantity of good quality seed in time.

The forage and pasture seed sector is faced with two types of constraints. The first is specific to the seed sector while the second relates to the development of range improvement activities in general. Furthermore, the demographic pressure has in some countries engendered a high demand for agricultural and livestock products. This has pushed farmers to overexploit pastoral resources and to convert productive rangelands into marginal croplands. The paper and the ensuing discussion stressed the following points:

At the technical, institutional and policy level, there is a need to:

- Elaborate national strategies and plans for the production of forage and pasture seeds.
- Promote private sector involvement in forage and pasture seed production.
- Intensify research in seed production, especially forage and pasture crop seed.
- Co-ordinate research, extension and seed production.
- Develop on-farm participatory research on seed production.
- Promote the integration of the formal and informal seed systems.
- Establish seed legislation and regulations for these crops.
- Intensify job training of farmers and extension staff.

At the regional level:

- Strengthen existing networks dealing with forage and pasture seed production in the region. The exchange of plant materials, expertise and information linked to research on forage and pasture species should be promoted.
- Reinforce activities of the international centres and institutions (FAO, IPGRI, ICARDA, CIHEAM, etc.) in the region related to training and collaborative research.

In the ensuing discussion participants made the following points:

- Forage seed production is considered a by-product, and therefore has not been given much support for development. The interest of the private sector in this area is limited.
- Privatisation of forage seed production is premature due to economic and other considerations.
- It was proposed that FAO assists in drafting model legislation and that each country in the region revises it according to local conditions and requirements. However, some guidelines must first be formulated by countries in the region.
- Action on technical, institutional, and policy aspects of forage seed supply must be taken at national and regional levels.
- Assistance by international centres and institutions (FAO, ICARDA, and IPGRI) should include training, collaborative research, technical advice, and support to networks.

2.9 National Seed Policy and Strategies for the Near East and North Africa

Governments have the responsibility to ensure adequate food supplies at reasonable cost. Policies should stimulate the development of the agricultural sector. For maximum effectiveness and at least cost to national resources, seed of improved varieties should be a major concern. This is particularly important in an era of rapid population growth and economic re-structuring. In general, it can be concluded that policies and strategies pursued during the past 50 years have not enabled the formal seed sector to successfully meet the needs of resource-poor farmers for important food crops. The percentage of quality seed of improved varieties supplied by the formal seed sector is still very limited

The paper discusses the importance of an effective, up-to-date, long-term, and realistic National Seed Policy backed by strategies to adopt and implement the policy. A national seed council,or a comparable mechanism, represented by a variety of actors in the seed sector, is essential to the formulation of policies and strategies for the future of the seed sector. Such a council also provides a structure through which greater continuity of goals and policies can be achieved.

In regard to privatisation, governments should create a market for seed and a favourable environment for the private seed sector to thrive. An investment promotion program is one of the mechanisms to attract the private sector and other incentives were also proposed. The paper also briefly discusses policies designed to enhance involvement of the informal seed sector and concludes that this sector needs to be supported in such a way that it can ultimately develop into a formal sector. Participatory plant breeding as well as the need for small, low overhead seed companies is discussed.

The paper concludes by discussing emergency seed relief. Preparedness is the key issue. A major component of any strategy designed to increase seed security is to have information available, which will allow quick responses in emergency situations. The strategy may also include: (a) initiation of national and regional seed security stocks; (b) strengthening of national seed industries to ensure that seed is available in the region when disaster occurs as well as to enable the production of quality seed for seed security stocks; (c) strengthening regional co-operation; (d) harmonisation of national seed policies, rules and regulations; and (e) regional variety evaluation.

In the ensuing discussion participants made the following points:

- It was pointed out that the development of seed production was not as expected, a major reason being the fact that it was not market oriented, but mainly technology oriented. Therefore, the governments must create a market for seed.
- It was argued that farmers are sensitive in their work and if properly trained, would do better at producing seeds than anyone else. Incentives to small-scale seed production enterprises must be given without too much interference by the government.
- It was mentioned that due to political reasons, some countries do not give the opportunity to the private sector to go into seed production.
- National policies should aim at harmonisation, and mechanisms should be designed so that each country is informed of other seed-related developments in the region. Seed rehabilitation and seed relief were given as examples.
- In order to encourage private enterprises, a favourable economic environment is necessary together with investment promotion programmes and incentives by the government.
- It was also suggested that development of the informal sector would complement further development of the formal seed sector.

2.10 General Discussion

The NENA region is a major importer of food grains. Self-sufficiency is declining by 1% per year on a regional basis. Despite this, agriculture remains the largest sector of the economy in many countries. Agriculture plays a critical role in maintaining the livelihoods of the rural population and contributing to balanced economic development and social stability. The access to quality seeds of well-adapted improved varieties is a key factor in sustainable development.

The staple food crops of the region are all cereals and legumes for which farmers must obtain seed every year. In most areas, only one crop per year can be grown on rainfed land and average yields are low. Irrigation is available in some countries, but water is a limiting factor across most of the region. Because of the existence of many well-developed urban markets, high-value cash crops, such as vegetables and fruits are of great importance. Likewise, the intensive production of fodder for direct feeding to animals and for cash sale in urban areas is an important part of crop production.

Despite the importance of agricultural productivity in the region, the current status of seed supply is not satisfactory. Farmers' needs for seeds are not always satisfied. There are also delays in delivering new varieties to farmers, and in many cases, farmers still have a very limited choice of varieties. In addition, the more specialised crops of the region have received very little attention.

The sector is constrained by a mix of policy, technical and economic factors. In particular, there is insufficient recognition of the importance of seed by policy makers and of the need to update policies to take into account changing circumstances in the world seed market.

Pressure on the environment in many parts of the region requires careful management to achieve sustainable agricultural productivity without damaging the natural resource base. For this reason, seeds of fodder and pasture crops must also receive attention in addition to the food grains.

Key issues discussed

In light of the above and the background information provided by the thematic papers, the following specific issues were discussed.

2.10.1 Need for a mechanism for regional and sub-regional co-operation in the seed sector, with the following broad objectives:

- A visible focus for all efforts to strengthen the seed sector;
- A forum for exchange of information and experience;
- A facilitating mechanism for mobilising support and resources; and
- A catalyst for developing pilot and larger scale projects, which will make an innovative contribution to the seed sector of individual countries and to the region.

2.10.2 Strategic issues

- National seed policies and strategies which define the role of the public and private sectors;
- Harmonisation of seed legislation and regulatory measures, including phytosanitary measures for seed-borne diseases;
- Effective utilisation of available plant genetic resources; and
- Seed security.

2.10.3 Research, training and technology transfer

- Promote better representation of seed technology in the curricula of universities and other teaching institutions to increase awareness of the seed sector among all agricultural professionals and technicians;
- Strengthen human resource development generally and, in particular, improve practical training in all seed-related activities;
- Give more attention to seed science research and improve the interface between research and the seed sector; and
- Maximise the efforts of all extension providers to ensure effective diffusion of information on new varieties and improved seeds.

2.10.4 Action required for specific crop groups

- Improve information on the supply of seeds and planting material for horticultural and fodder crops;
- Emphasise the production and improvement of well-adapted local materials;
- Conduct research on production procedures to maximise yield and quality of these seeds and improve the competitiveness of local production; and
- Exchange information and expertise within the region through bilateral and multilateral arrangements and projects and with the assistance of international agencies.

2.10.5 Donor Support

The distinguished delegate from GNIS (France) expressed his willingness to seek financial support from government agencies for work on seed regulations and seed information management in the NENA region, provided that these activities are part of a solid technical programme under the consultative forum.

3. RECOMMENDATIONS

THE REGIONAL CONSULTATIVE FORUM ON SEED POLICY AND PROGRAMMES FOR THE NEAR EAST AND NORTH AFRICA

The Meeting proposed and agreed to establish a Regional Consultative Forum on Seed Policy and Programmes for the Near East and North Africa and requested that it be placed under the aegis of the FAO. The forum will be open to all countries interested in the development and improvement of the seed sector and crop genetic resources in the region. The Consultative Forum will facilitate inter-country scientific collaboration on seed production, with the assistance of relevant establishments and fora to promote crop genetic resources evaluation, conservation and utilisation. The Forum will initially function on a voluntary basis until a formal status is designed and approved by the respective member governments. The Consultative Forum will be composed of: institutions from each member country (represented by an officially designated specialist – focal point); international institutions that are active in the seed sector in the region; a representative of national seed (trade) association) or of seed company(ies) in case no national seed associations exist, and invited resource persons. The Consultative Forum was given the acronym Consultative Forum on Seed in the Near East and North Africa (**CFS-NENA**).

To address regional scientific issues of difficult nature, the forum will be supported by specialised scientific and technical working groups. These specialised groups will link the seed initiatives in different parts of the region to the Consultative Forum, which in turn will connect the region to other regional initiatives on seed development, conservation and utilisation of crop genetic resources.

The regional Consultative Forum will also play a role in harmonising and strengthening on-going networking initiatives in the seed sector and promote new undertakings at national and sub-regional levels. In this respect, the existing regional and inter-regional seed and crop genetic resources networks (such as the WANA Seed Network and PGR WANANET) have been identified to actively participate in the Forum.

The Forum encourages the participation of countries/institutions/organisations that are interested to collaborate in this endeavour.

The meeting recommended that FAO should explore the possibility to assist in establishing and launching activities of the Forum. The FAO should provide technical support in the harmonisation and guidance on technical and policy issues and explore possibilities for financial support of the activities of the Consultative Forum.

Consultative Forum Co-ordination and Strategy

The general meeting of the Consultative Forum will be convened every 2 years and will be overseen by a chair and a vice chair elected by the meeting. The first general meeting will be tentatively held in 2001 and Cyprus offered to host this first general meeting.

An interim co-ordinating committee has been established to work in close collaboration with FAO to keep the momentum of the meeting and to carry out the activities towards the constitutional establishment of the Consultative Forum. The interim co-ordinating committee will be composed of a general co-ordinator and the six working group co-ordinators, designated during the adoption of the report of the meeting. The date and place of the first meeting of the interim co-ordinating committee will be decided in consultation with FAO. It is envisaged that the interim committee will conclude its work when the first forum meeting is held.

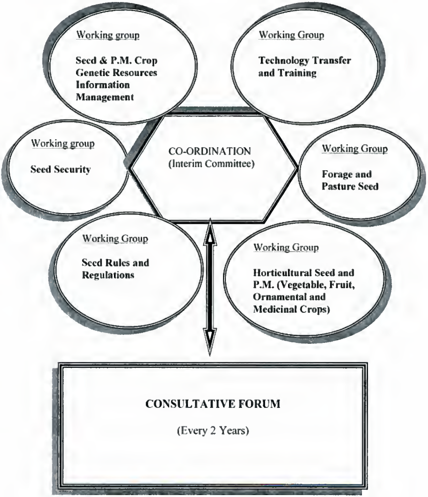
Six working groups were defined to carry out the scientific and technical work identified as pertinent for the development of the seed sector in the region. Each working group will be led by a co-ordinator.

Working Groups will organise meetings on specific technical topics. Associating these meetings with other national and international workshops, symposia or conferences will be pursued as means of facilitating participation.

All group co-ordinators should officially confirm their acceptance to the interim committee with copy to the FAO Seed and Plant Genetic Resources Service (Dr U.G. Menini, AGPS) **within three months**.

The designation of co-ordination responsibilities will be subject to periodic review at each meeting of the Consultative Forum, and revision whenever necessary, with a view to ensuring that the Consultative Forum and its working groups continue to receive all the support and leadership required. In this regard, questions related to the functioning of the Working Groups will be referred to the Interim Committee, which will take interim measures as necessary to ensure efficient operations.

The structure of the Consultative Forum is represented in the following chart.


Working group
Seed & P.M. Crop Genetic Resources Information Management
Working Group
Technology Transfer and Training
Working group
Seed Security
CO-ORDINATION
(Interim Committee)
Working Group
Forage and Pasture Seed
Working Group
Seed Rules and Regulations
Working Group
Horticultural Seed and P.M. (Vegetable, Fruit, Ornamental and Medicinal Crops)
CONSULTATIVE FORUM
(Every 2 Years)

P.M. = Planting material

3.1 The Role and Functions of the Interim Co-ordinating Committee and Consultative Forum

3.1.1 Interim co-ordinating committee

Make preparations for the establishment of the Consultative Forum, including the following specific actions:

- Communicate with all countries and international organisations of the region in consultation with FAO to confirm their interest in participation in the Forum.
- Prepare information explaining the role of the proposed Forum and circulate this to interested parties, including a website in association with FAO.
- Prepare a draft constitution for the Forum taking into account the recommendations made at the Cyprus meeting and to be approved at the foundation meeting of the Forum.
- Prepare the foundation meeting of the Forum.
- Co-ordinate the activities of the different working groups.
- Promote specific meetings on technical subjects.
- Promote efforts to obtain funding assistance from donors and financing agencies for the activities of the Forum and the working groups.

3.1.2 Consultative forum

The consultative Forum will thereafter be responsible for the activities listed below and any other relevant issues:

- Facilitate communication among the different working groups and regional seed and crop genetic resources networks.
- Facilitate adaptation of the working arrangements of the Forum to meet member requirements and to ensure efficiency of operations.
- Co-operate to identify and obtain funding assistance from donors and financing agencies for strengthening the Forum activities.
- Actively participate in issues and undertakings in the other regional initiatives and fora of the FAO and other relevant regional institutions concerned with seed policies and programmes.
- Oversee the co-ordination of the working groups and the management structure of the Consultative Forum after its official status has been recognised.
- Assist in the formulation of national seed policies and projects.
- Provide consulting support to member countries.

To facilitate general communications and sharing of information, it was agreed that one or more websites should be developed. Duplication of the site in French, Arabic and other languages would further facilitate communication. The FAO/AGPS Service will also provide linkages in its website for this purpose.

3.2 Technical Working Groups and Co-ordinators

The meeting identified specific issues to be addressed by the technical working groups, which will form the basis for the Consultative Forum. Participation in the working groups is open to any interested scientists, organisations and associations, as well as researchers from the private sector.

3.2.1 The role and functions of the technical working group co-ordinators

The responsibilities of the technical working group co-ordinators were defined as follows:

- Develop and guide activities appropriate for the working group.
- Prepare and disseminate annual progress reports on working group activities and promote appropriate scientific contributions to be included in the Consultative Forum newsletter.
- Promote specific meetings on technical subjects within their groups' area of activity.
- Develop communications, through electronic and other media, to facilitate sharing of information and intra-group contacts.
- Prioritise the work of their group depending on the resources available and the perceived needs of member countries.

The profile and provisional agenda for the six working groups were established by the meeting as follows:

3.2.2 Technical working groups

I: Working Group on Seed and Planting Material and Crop Genetic Resources Information Management

Objective: *Ta promote and facilitate the callection and exchange an seed production and crop genetic resaurces information in NENA*

Activity 1: Develop a regional database on seed supply systems and crop genetic resources currently maintained in the region.

Means of Action:

- Design and implement an inventory at the national level of seed supply systems and crop varieties currently grown by farmers in the region.
- Construct a relational database on seed supply systems and crop genetic resources that are maintained and used at national agricultural research institutes, international agricultural research centres and by the private sector in the region.

Activity 2: Build a web site with linkages to web pages such as the CG Centres and other appropriate sites to provide access through the Internet to these databases.

Means of Actian:

- Construct a World Wide Web site to facilitate access through the Internet on seed and crop genetic resources, which are currently maintained and/or used in the region. This information would be used for the identification of the seed systems and crop varieties that are currently grown by farmers in the region. It would also provide information about the seed systems and crop genetic resources that are maintained and used by public and private plant improvement programmes.

II: Working Group on Seed Rules and Regulations

Objectives: *Assist countries af the regian to update their seed legislation and regulatians to take account of changes in the seed industry hoth natianally and internatianally.*

Thraugh this process, also promote the harmonisation of seed laws, regulations and standards ta facilitate trade within the regian.

To make the task manageable, and to reflect the different technical agencies that may be involved, the following proposed activities deal with the components of seed legislation and regulation separately.

Activity 1: Preliminary assessment of needs and priorities

Means of action:

- Review the current status of seed laws and regulations within the region and identify sub-regions within which a more uniform regulatory framework would be desirable.
- Based on this review, assess the willingness of countries to participate in this activity in principle, and the extent of their needs for seed laws, certification standards, and plant variety protection.
- Identify key contact agencies and persons in the participating countries, and for each of the selected topics.
- Prepare a realistic and prioritised schedule for implementing the proposed activities for each of the major crop groups.

Activity 2: Preparation of a draft seed law.

Means of action:

- Collect and review existing seed laws of participating countries, and any draft revisions, which have been prepared.
- Harmonize seed regulations facilitating better seed movement and exchange in the region by drafting a model seed law.
- Translate into Arabic and circulate to the participating Ministries for comment.
- Convene a meeting to review and approve the model law and propose and advocate its acceptance by participating governments.

Activity 3: Revise and update uniform field and seed standards for the major crops of the region.

Means of action:

- Collect and review existing field and seed standards for the major crops of the region.
- Prepare realistic minimum standards and procedures as the basis of a draft sub-regional certification scheme.
- Circulate to certification agencies in the sub-region for comment and incorporation of needed amendments.
- Prepare a draft regional certification scheme for consideration by Governments and their technical agencies.

Activity 4: Elaborate on phytosanitary regulations and regional harmonisation.

Means of Action:

- Assess phytosanitary regulations of all countries in the region and identify constraints for harmonisation.
- Based on this assessment and in close collaboration with the FAO, especially the secretariat of the International Plant Protection Convention (IPPC) and Prior Informed Consent (PIC), and other international organisations involved in plant and seed health, define eventual actions to be undertaken in the region to improve standards and facilitate seed movement across countries.

Copyrighted material

Activity 5: Elaborate on a plant variety protection law in accordance with the existing seed laws

Means of action:

- Assess the current status of variety description/registration procedures and facilities in the participating countries
- Assist countries in the preparation of a model PVP law based on the UPOV 1991 Act and also with the model seed laws, mentioned in Activity 2.
- Translate into Arabic and circulate to the participating Ministries for comment.
- Convene a meeting of the concerned staff to review implementation of the draft law and possible regional collaboration in variety testing.
- Prepare a revised draft law and propose or advocate its acceptance to participating countries, particularly those, which have signed the WTO agreements.

III: Working Group on Technology Transfer and Training

Objectives: To promote national programmes of research, education, and training on seed production and technology at academic, technical and practical training institutions.

To strengthen farmers' capacity to produce high quality seed

Activity 1: Carry out a survey of recent seed research and output to be used for training activities and develop an inventory of training capacity in the major sub-regions.

Means of Action:

- Design and implement a survey of relevant training programmes and training institutions at the national and regional level.
- Design and implement a survey of informal training methodologies and activities within local communities documenting indigenous knowledge relative to farmers' (women and men) seed production and management systems.

Activity 2: Develop a comprehensive training programme policy that addresses the needs of the national seed programmes and regional co-operation on seed security which includes all relevant stakeholders.

Means of Action:

- Design and implement seed training programmes that reflect the needs of the major sub-regions and the major seed sector stakeholders.

Activity 3: Develop an approach to farmer and farmer community training with particular emphasis on the informal seed sector.

Means of Action:

- Carry out an assessment of the respective and complementary roles played by women and men in seed sector activities, which underpin seed security.

Activity 4: Design and implement mechanisms for information dissemination and networking relative to farm-level methodologies to improve seed and planting material production and management.

Means of Action:

- Design ways of exchanging important information on seed production between farmers, farmers groups, local communities, etc.
- Design ways to successfully communicate with farmers (women and men) on improved seed and planting material production and management practices, including multiplication, storage and marketing seeds and planting material of adapted varieties.

Activity 5: Develop information on seed technology equipment suitable for small seed production farmers.

Means of Action:

- Assess seed technology equipment and facilities at national level and promote field demonstration on modern machinery.

IV: Working Group on Forage and Pasture Seed

Objective: *To promote forage and pasture seed production in the region*

Activity 1: Identify and harmonise the mechanisms for the production of high quality seed of pasture and forage crops in the region.

Means of Action:

- Conduct a thorough review of public and private agricultural infrastructure in the region. Identify those with adequate facilities to multiply seeds of varieties adapted to the agro-ecological and socio-economic conditions under which the respective crops are grown.
- Develop an action plan to facilitate the multiplication of forage, and pasture seeds crops.
- Design guidelines for promoting sustainable development of forage and pasture seed production at the regional level.

Activity 2: Identify common constraints in the utilisation of forage genetic resources within the region.

Means of Action:

- Identify priority crop to be considered for forage seed production in the region and develop appropriate guidelines for national extension services.

Activity 3: Promote distribution systems for seed of adapted forage, and pasture crops in the region.

Means of Action:

- Provide guidance to national extension services on programmes to be undertaken in order to assist farmers to improve pasture crop production through high quality seeds.

Activity 4: Develop reliable statistics of relevant data and information on pasture, and forage seeds.

Means of Action:

- Update and maintain proper database related to forage and pasture genetic resources, crop production and seed requirements and availability, including research activities and scientific information on forage seed. Disseminate this information through the World Wide Web.

V: Working Group on Seed Security

Objective: *To assist countries in their efforts to overcome seed shortage in normal or emergency situations*

Activity 1: Design regional, sub-regional, and national mechanisms and programmes to establish an ongoing system for storage and supply of seeds of locally adapted varieties.

Means of Action:

- Determine national-level mechanisms and programmes enabling linkages among the major stakeholders at the regional, sub-regional, and national levels.
- Liaise with the technical working group on the harmonisation of seed rules and regulations to determine constraints to the movements of seed stocks of adapted varieties in disaster situations.
- Design regional, sub-regional, and national mechanisms and programmes to make better use of the information provided by early warning systems.
- Liaise with the other technical working groups of the Consultative Group.
- Determine effective strategies for the multiplication and delivery of seed in disaster situation.

Activity 2: Collect relevant information in order to quickly respond to the occurrence of a disaster.

Means of Action:

- Identify household consumer preference and other socio-economic data.
- Collect information on major crops and varieties and farming systems in the region affected by a calamity and disaster and available seed stocks of regionally adopted varieties.
- Determine mechanisms enabling linkages among the major stakeholders at the regional, sub-regional and national levels to procure appropriate seed stocks.

VI: Working Group on Horticultural Seed and Planting Material (Vegetable, Fruit, Ornamental, and Medicinal Crops)

Objective: *To promote sustainable development of vegetable seed production at national and regional level*

Activity 1: Identify strategies and mechanisms for the development of vegetable seed and planting material production in the region.

Means of Action:

- Identify vegetable crops deserving investments and promote national policies to facilitate growers to produce vegetable seed.
- Develop programmes for improving sustainable vegetable seed production and market at national and regional levels.
- Keep record of the organisations and facilities working on vegetable seed production in the countries of the region.

Activity 2: Provide and update database related to vegetable seed production for the region.

Means of Action:

- Develop and maintain proper database related to vegetable crop production and seed requirements and availability at country level, as well as on research activities on vegetable seeds. Dissemination of information through interactive home page on the World Wide Web.

3.2.3 Co-ordinators

The interim co-ordinating committee

Co-ordinator: Mr. Ayman ABDOU-HADID
Professor of Horticulture
P.O. Box 68, Hadajek Shobra
Cairo, Egypt

Working group co-ordinators:

Working Group I: Seed and Planting Material and Crop Genetic Resources Information Management

Co-ordinator: Mr. Abdel Adnan NOUR
Ministry of Agriculture
Head of Plant Production Control Division
Amman, Jordan

Working Group II: Seed Rules and Regulations

Co-ordinator: Mr. Michael R. TURNER
Head of Seed Unit, ICARDA
P.O. Box 5466
Aleppo, Syria

Working Group III: Technology Transfer and Training

Co-ordinator: Mr. Majid DEHGHAN-SHOAR
Associate Professor of Seed Technology
Head of Seed Technology Department
General Director of International and Regional Organisations
Ministry of Agriculture and Technology, Tehran, Iran

Working Group IV: Forage and Pasture Seed

Co-ordinator: Mr. Mohammed TAZI
Director, Centre de Production des Semences Pastorales
B.P. 79 El Jadida
Morocco

Working Group V: Seed Security

Co-ordinator: Mr. Chéhandé BEJJANI
Head of Import-Export Department
Ministry of Agriculture
Lebanon

Working Group VI: Horticultural Seed and Planting Material (Vegetable, Fruit, Ornamental, and Medicinal Crops)

Co-ordinator: Mr. Ayman ABDOU-HADID
Professor of Horticulture
P.O. Box 68, Hadajek Shobra
Cairo, Egypt

Copyrighted material

REGIONAL MEETING ON SEED POLICY AND PROGRAMMES IN THE NEAR EAST AND NORTH AFRICA

*Opening address**

by

H.E. The Minister of Agriculture, Natural Resources and Environment Mr. Costas Themistocleous

Mr. Chairman,
Distinguished participants,
Ladies & Gentlemen,

It gives me great pleasure to extend to you a very warm welcome to Cyprus and to this important regional meeting on seed policy and programmes in the Near East and North Africa.

We have gladly accepted the idea of hosting this meeting in Cyprus and I would like to express my deep appreciation to the Food and Agriculture Organization of the United Nations for their decision to organize it here, in collaboration with the Agricultural Research Institute.

Our country has a long history of productive cooperation with FAO, which goes back to the years immediately after Independence in the early 1960's. At that time, the newly established Republic of Cyprus was embarking on a major development effort, trying to mobilize all available productive resources and to create the necessary infrastructure that would ensure the economic development and progress of its people.

In this effort, FAO played a major role and contributed greatly to the successful development of the agricultural sector, which has made remarkable progress.

Today, despite the rapid expansion of other sectors of the economy, like tourism and services, agriculture continues to be an important sector of the national economy, contributing about 5% to the GDP, providing employment to about 10% of the economically active population and contributing more than 34% to domestic exports, supplementing the income of thousands of rural families and providing raw materials to the agro-industrial sector.

The Government of Cyprus is determined to maintain and further develop this basic primary sector. Rural development plans focus mainly on the provision of adequate infrastructure, improvement of the social and economic position of the farmers, increasing productivity and export maximization.

The subject of your meeting, namely seed policy and programme is of considerable importance for the development of the agricultural sector. It is widely accepted that the use of high quality seed combined with good farming practice can lead to higher productivity and improve farm income.

Seed production, processing marketing and certification have been introduced in Cyprus as early as in 1945. The Department of Agriculture has been dealing initially with the production of vegetable seeds for export but subsequently attention was focused on the production of seed for domestic use. Today the Seed

---

* The address was read by Mr Panayiotis Aristotelous, Acting Permanent Secretary, Ministry of Agriculture, Natural Resources and Environment

Production Center of the Ministry of Agriculture is a dynamic Center processing seeds of cereals, forage crops, food legumes and vegetables for domestic sale covering a large part of local demand for such seeds. Supply of good quality seed is of vital importance for the farmers of our region. I am confident that the deliberations of the meeting will highlight the existing situation in the countries of the region, will identify existing problems and will formulate recommendations to overcome them. The meeting will at the same time prepare the ground for future cooperation on this issue. The Ministry of Agriculture, Natural Resources and Environment will be looking forward to receive your recommendations. May I conclude by wishing you every success in your deliberations and to you, distinguished speakers and participants, a pleasant stay in Cyprus during the meeting and a safe return home after its conclusion

Thank you very much.

REGIONAL MEETING ON SEED POLICY AND PROGRAMMES IN THE NEAR EAST AND NORTH AFRICA

Opening Statement

by

Dr Mahmud Duwayri,
Director, Plant Production and Protection Division, FAO

Dr Aristotelous, Representative of His Excellency the Honourable Minister of Agriculture, Dr Papachristodoulou, Director of the Agricultural Research Institute, Dr Costas Gregoriou, distinguished guests and participants, dear colleagues and friends.

To begin with, let me welcome all of you, on behalf of the FAO, to this important technical meeting on Seed Policy and Programmes in the Near East and North Africa, and express my sincere thanks to the Government and people of Cyprus for the warm welcome they have provided.

It is indeed a privilege for me to take the floor in this important event. This meeting has a broad technical coverage and its aim is to deal in an integrated manner with numerous issues and activities related to seed production and improvement, and to stimulate reflection on the important role that this sector is playing for crop and agricultural development in the Near East and North Africa.

It was in this region of the Near East and North Africa, that the first seeds were collected, saved and sown by the first farmers. The process of harvesting and replanting selected seed led to the domestication of crops, which today feed a huge segment of the world population. Today most farmers of the world continue to save seed from their harvests for replanting in the following season. They also often look for new seeds to meet particular needs and to adapt to changing circumstances. Many modern variety improvement and breeding programmes are based on local population and genetic diversity safeguarded by the farmers of this region.

Mr. Chairman, as you know, FAO is working at the forefront in the fight against hunger, malnutrition and poverty. It is sad to acknowledge that, with barely six months to the new Millennium, many developing countries, including countries in the Near East and North Africa, are beset with acute shortage of basic food. FAO, not long ago, launched the Special Programme for Food Security with special emphasis on assisting Member Countries to harness their potential for achieving food self-sufficiency. Embedded in this effort is the strategy to use good quality seed of adapted improved and local varieties as a tool for enhancing farm productivity.

Considering that seed is fundamental to farming, we should ensure that farmers have unimpeded access to quality seed of well-adapted varieties.

The Plan of Action adopted by world leaders at the World Food Summit in Rome, in November 1996, affirmed the need for food security for all peoples. Among others, the Plan of Action called for the creation of policies and conditions that will encourage public and private investments to contribute to food security and the mobilisation of resources to increase investment in areas linked to food security.

The formal seed production sector is of very recent origin, even in the developed countries. It evolved in response to a need for increased farm productivity in situations where a diminishing part of the population had to produce much more food to feed the greater populace concentrated in the industrialised areas and swelling cities. In the Near East and North Africa, where the formal seed sector is even more recent, there is abundant evidence that more than 90% of the planting materials needed to cultivate staple food are still provided through on-farm seed production and distribution that is organised by farmers themselves - the so-called "informal seed sector".

The age-old tradition of on-farm seed saving has been responsible for the diverse plant genetic base, which forms the "building blocks" of modern high yielding varieties developed by plant breeders. It is pertinent to recognise that by keeping resource utilisation in equilibrium with the environment through a range of strategies and techniques to cope with the vagaries of an unstable agro-socio-ecological situation, farmers have been able to lay a firm foundation for their survival.

Unfortunately, this time-proven innovation of seed self-provisioning is under siege from disasters (man-made and natural) leading to seed shortages, which threaten resource-poor farmers' ability to carry on their farming activities. Such disasters as droughts, floods, storms, civil strife and wars, have in recent years, devastated parts of the Near East and North Africa with dire consequences not only for food production but also for the safety of the region's plant biodiversity.

These problems were recognized by Governments when they developed the Global Plan of Action for the conservation and sustainable use of plant genetic resources for agriculture. This Plan, adopted by 150 countries at the Leipzig International Technical Conference in 1996, includes a priority activity on "Supporting Seed Production and Distribution". It includes quite specific recommendations for governments, and their national agricultural research systems, taking into account also the views of the private sector, farmers' organizations and their communities.

Several regional seed initiatives and crop genetic resources related networks have been established in the region during the last years, assisted and sponsored by regional and international institutions and organizations such as: ICARDA, ICRISAT, GTZ, WANA, FAO etc., to mention only a few of them. These activities and particularly the networks are playing an important role in developing the member countries seed sectors. However, based on the analysis and findings presented in the background document of this Meeting, the need is recognized for better policy coordination and harmonization, in order that all efforts made by national, regional and international stakeholders and institutions to enhance the seed industry in order to meet the farmers requirements on PGR conservation and use, and seed and planting material production. The recommendations of this Meeting should provide member countries with valuable guidance for developing a concerted strategy for seed and planting material production and distribution systems, based on a sound seed policy and feasible seed development programmes.In achieving this FAO could provide valuable guidance and technical assistance.

At this juncture, on behalf of the Director-General of FAO, I wish to thank the Government of Cyprus for hosting this meeting. My congratulations go to the National Organizing Committee for so ably making all the necessary local preparations. I also wish to commend all my colleagues from the Seed and Plant Genetic Resources Service, particularly Dr U.G. Menini, Chief of the Seed and Plant Genetic Resources Service, and Dr I. Sikora, the Seed Senior Officer, whose vision and dedication to the development of the seed sector have made this meeting a reality.

Finally, I wish to thank all the resource persons, participants and guests who are here with us this week. Special thanks are also addressed to all the international organisations and to the governmental and non-governmental organisations, as well as the private seed companies and associations, that have responded to FAO's invitation to attend this Meeting.

I thank you all and wish you a pleasant stay in Cyprus and a very fruitful Meeting.

SEED PRODUCTION AND IMPROVEMENT: ASSESSMENT FOR THE NEAR EAST AND NORTH AFRICA
(SEED SECURITY FOR FOOD SECURITY)

Seed and Plant Genetic Resources Service (AGPS), FAO, Rome, Italy

1. INTRODUCTION

Achieving national food security while reducing environmental degradation and the depletion of natural resources is one of the important challenges facing most countries in the Near East and North Africa. Most governments in the region have invested significant resources into strengthening their agricultural capacities. In addition, the region has received assistance from bilateral and multilateral development agencies to attain food security. However, despite these efforts, the food self-sufficiency ratio in the Near East and North Africa has been falling by 1% each year mainly due to high population growth. As a result, the 1996 World Food Summit concluded that more assistance and realistic approaches in the agricultural sector are needed if food security is to be achieved and sustained in the region. In response, the Rome Declaration on World Food Security and the World Food Summit Plan of Action has established the foundation for diverse paths to guaranteeing food security. The strengthening of the seed supply sector is one of the main strategies for the Near East and North Africa (FAO, 1997a).

Guaranteeing farmers ongoing access to quality seed can only be achieved if there is a viable seed supply system to multiply and distribute the seeds of plant varieties that have been produced or preserved and if mechanisms to assist farmers in emergency situations have been established. Agricultural policies aimed at achieving food security in a country must emphasize seed system strategies that will ensure the availability of quality and locally-appropriate seed varieties to men and women farmers in a timely and affordable fashion.

An in-depth assessment of the seed supply sector in the Near East and North Africa is essential before any realistic strategies for future development of the seed sector in the region is designed. In this document, the seed supply sectors of 22 countries in the Near East and North Africa are examined and issues relevant to the seed production and distribution in the region are also evaluated. Furthermore, the document analyzes important linkages between the seed supply systems and other services offered to farmers in the region. Alternative strategies for policy makers that can be adapted according to the prevailing conditions in each country are also explored.

The document is comprised of five chapters. The first chapter briefly describes climatic and agro-ecological features of the Near East and North Africa, socio-economic conditions, and natural resource conservation and management. The agricultural sector of the region is assessed in the second chapter. Seed and food security in the Near East and North Africa is evaluated in the third chapter. The fourth chapter entails an analysis of the seed supply sector, and final chapter discusses opportunities for future improvements, actions to strengthen the seed sector in the region, and a brief conclusion. A summary data of the agricultural and seed supply sectors in the Near East and North Africa is attached as an annex to this report.

1.1 Agro-ecological and Socio-economic Setting

1.1.1 Agro-ecological zones in the Near East and North Africa

Rafiq (1982) described ten agro-ecological zones in the Near East and North Africa. However, for the purpose of this document, only the three most important will be described. The hot sub-tropical desert, which dominates the landmasses of most countries in the region, extends through Saudi Arabia, Yemen, Iraq, Kuwait, Syria, Lebanon, Jordan, Egypt, Libya, Tunisia, and Algeria. Agriculturally, these countries have very low potential except for a few areas where irrigation projects have been developed or oasis agriculture is practiced. The area under perennial crops and forest is negligible in this ecosystem, as 70% of the land is desert or semi-desert. It is estimated that desertification in the region, is progressing at 0.5% annually, and most countries are well aware of the implications of the deserts rapid encroachment.

Next in landmass is the arid sub-tropical Mediterranean region which covers most of Pakistan, southern Afghanistan and Iran, and the coastal areas of Egypt and Libya. Throughout most of these zones cropping is only possible with irrigation. However, there are areas, some quite small, where water sources have been exploited for agriculture. In a few rare instances, like the irrigation projects developed in Libya, vast sources of underground fossil water have been exploited for agriculture. These areas support nomadic tribes that survive on livestock farming. The rangelands have a very fragile natural resource base, and as in most parts of the region, rangelands have been over-grazed and over-exploited to the limit of irreversible degradation. Sustainable agricultural production in these rangelands could only be attained with careful handling of the resources to conserve the fragile environment.

The semi-arid Continental Mediterranean region, which covers northern Afghanistan and Iran, and most of Turkey, is characterized by winters and low winter rainfall suitable for winter wheat. With an annual precipitation of 400- 800-mm, this region is assured at least one good cropping season. Arable lands in such areas are predominantly used for cereal cropping of wheat, barley, maize and sorghum. A short rainy season also occurs in the spring when a growing season of about 60 days is sufficient for short-season crops like grain legumes (chickpea, cowpea, faba bean, sesame, common bean, etc.) and small millets. Irrigated agriculture and orchard cropping is also carried out in cool semi-arid mid-elevations in several countries. This area also has a high potential for quality seed production.

In the agro-ecological zones of the rest of the region, rain-fed crops are grown, but yields are usually low. In addition to rainfed agriculture, major irrigation projects have been successfully carried out in Egypt, Morocco, Turkey, Algeria, Iran and Iraq.

1.1.2 Economic status of the countries in the Region

The economies of most countries in the region are dominated by the oil industry. However, depressed oil prices, and rises in non-oil commodity prices, have seriously hurt the region's economies, particularly those of the major oil exporters. For instance, in 1994 oil prices reached their lowest levels since 1973 and prospects for significant increases in prices, at least in the short-term, do not appear encouraging. These problems have resulted in economic reforms focused on improving economic efficiency and reducing external debt. As a result, most governments have recognized agriculture as critical for the overall development of the region.

Although there are large variations among countries, the agricultural sector plays an important role in the economy of many Near East and North African countries. It employs on average 25.7% of the working population, ranging from 1.3% in Kuwait to 56.1% in Yemen and shares on average 15.1% of the Gross Domestic Product (GDP), ranging from 3.1 to 41.4% (FAO, 1996; Le Buanec, 1997).

In regard to food export, several countries on the Mediterranean rim in the Near East and North Africa export agricultural products such as olives, dates, citrus fruits, and cotton to lucrative markets in Europe and thus obtain valuable foreign exchange earnings. For example, Iraq produces 80% of the world' dates. Saudi Arabia and, more recently, Syria are exporters of wheat. Countries such as Egypt, Saudi Arabia, Syria, Turkey, Jordan, Libya, Tunisia, and Morocco have made remarkable advances in controlled environment farming of horticultural products for both domestic consumption and the export market. These efforts have generated foreign exchange as well as seasonal employment opportunities.

1.2 Natural Resource Conservation and Management

The Near East and North Africa region is the center of genetic diversity of some of the world's major food crops such as wheat, barley, oat, rye, lentil, pea, oats, beet, artichoke, olive, grape, onion, garlic and date palm (FAO, 1996b). However, most countries in the region have reported the extinction of some plants from their center of origin. Genetic erosion is generally caused by the replacement of local varieties by "improved" or exotic varieties, in addition to population pressure and urbanization. Overgrazing and environmental effects are mentioned as important factors contributing to the decrease in natural genetic variability in Morocco, Saudi Arabia, and Yemen.

The natural resource base on which agriculture in the Near East and North Africa depends is under extreme stress. Land resources are scarce and poor, and the situation is being exacerbated by rapid desertification. Only a small percentage of the region's area is arable and the area under perennial crops and forests is small. Much of the land has steep slopes and/or shallow, rocky or saline soils that are unsuitable for cultivation without extensive and expensive reclamation work. Much soil is lost annually to erosion by wind and water, and rangeland vegetation is degrading under the pressure of overgrazing. Due to the rising demand for food, continuous cereals are replacing the traditional cereal-fallow rotation, which further depletes land and increases the virulence of diseases, undermining the sustainability of production. The conservation and maintenance of land and its productivity are, therefore, of crucial concern.

Given these conditions, new technologies to increase system productivity must take into account the fragile environment on which they will depend over the short- and long-term.

2. THE AGRICULTURAL SECTOR

The agricultural performance in the region is characterized by pronounced fluctuation over time. In fact, the Near East and North Africa region has the highest year-to-year variability in crop production than any other developing region. For example, compared to the previous year, the region's agricultural production increased by 3.3% in 1992, 1.5% in 1993, 2% in 1994, and slowed to 1.7% in 1995 (FAO, 1995, 1996). Furthermore, higher population growth rates largely outpaced increases in food production registered in the past four years, resulting in reduced levels of per caput food production.

Although the agricultural potential also varies widely among countries, the region's agricultural resource base in general is subject to a number of common constraints (FAO, 1994c). The most pressing is low and erratic rainfall, which severely limits food crop production. Fragmented landholdings, a scarcity of arable land and a lack of adequate infrastructures, such as transport, communication, research extension services and marketing systems are additional constraints in rural areas. The serious degradation of natural resources caused by soil erosion, desertification, waterlogging and salinity are other factors that inhibit agricultural growth and threaten sustainable food production.

Crop and livestock farming are the main agricultural pursuits of most small farmers in the region and wheat and barley dominate the agricultural production. Wheat is the staple food crop and barley is the major feed source and, to a lesser extent, a human food in practically every country where it is grown. There has been rapid progress in genetic improvement of these two crops, especially in more favorable agricultural areas. However, the new varieties have generally not been adapted or accepted by the farmers who generally work under adverse conditions.

Wheat and barley have registered a steady increase in production since the last two decades. This increase was mainly due to expansion into new farming areas, improvement of productivity in favorable areas mainly by the use of improved varieties, and appropriate management practices in certain countries.

However, despite this increase the region is still a net importer of wheat and barley (FAO, 1995). To further raise the production, agricultural policies that promote crop productivity in marginal land areas should be encouraged. The development of varieties that are adapted and accepted by most farmers working under agricultural constrained conditions and the strengthening of on-farm seed production appears crucial throughout the region.

The most important food legumes are faba bean, chickpea, lentil, and, to a lesser extent, dry pea. Faba bean is grown extensively in the wetter coastal zones and is produced under irrigation in North Africa. Chickpea is adapted to areas receiving 350-450 mm annual rainfall and lentil is cultivated in drier zones in the Near East. These three crops account for nearly 73% of the total area cultivated to cool-season food legumes in the region. Within the last few years, several national projects for legume improvement have been developed; most of which are supported by the International Center for Agricultural Research in Dry Areas (ICARDA). While legume breeding is now receiving more attention, there is still lack of good legume cultivars and seed production of food legumes is relatively undeveloped in many countries in the region.

2.1 Dependence on Food Imports

Most countries in the Near East and North Africa region rely heavily on food imports to meet their increasing food demands. The region is the largest food-importing region in the developing world, with its food self-sufficiency ratio falling by 1% each year. Agricultural importation now accounts for 25% of its total imports. In the past decade, the import of important staples such as cereal, livestock products, vegetable oils and sugar have increased substantially.

In monetary terms, ICARDA (1993) estimates that the value of total food imports into the region increased more than four-fold from approximately US$ 3.6 billion in 1969-71 to about $ 16.6 billion in 1988-90. For instance, cereal imports increased from 8.1 million tones between 1969-71 to 44.3 million tones between 1988-90. Cereal imports are being projected to reach 78.7 million tones by the year 2010, with wheat as the largest single cereal commodity imported (wheat represented 65% of all cereal imports in 1988-90) estimated to reach 44 tones by the year 2010. Furthermore, due to the rapid degradation of native pastures, livestock production is currently depending almost entirely on imported cereal grain and straw, increasing coarse grain imports faster than wheat or rice. For instance, between 1969-71 and 1988-90, coarse grain imports increased 13-fold to 13.3 million tones and are projected to reach 20.3 million tones by the year 2010.

These large increases in imported agricultural products have led to a sharp rise in foreign exchange expenditures on food imports. The projected increases in food imports may not constrain the oil-producing countries, but would certainly aggravate the balance of payment in other countries in the region, especially the Low-Income Food Deficit Countries (LIFDC) such as Afghanistan, Mauritania, Egypt, Morocco, Pakistan, and Yemen. Most of the LIFDCs in the region spent on average over 25% of their merchandise export earnings on food imports.

It has been estimated that food production increases would have to be sustained at over 5% a year to keep pace with the projected food and feed gap. However, efforts to increase domestic food production in the region have been mainly hampered by the scarcity of arable land.

2.2 National Agricultural Policies

Most Near East and North Africa governments recognize the importance of agriculture in the economy. Therefore food security, economical reform and sustainable agricultural development are high priorities in national development plans. A primary objective of agricultural policies in most countries in the region is to achieve self-sufficiency in strategic crops.

In general, due to structural adjustment programs, the general targets of economic liberalization and market-oriented reforms have dominated the policy environment for agriculture. However, the efficiency of operations has been constrained by technical, financial, social, and infrastructure limitations and agricultural markets are still, in many cases, heavily regulated in the region. In some countries, prices of basic food items have been controlled to keep the cost of living down, and others have subsidized producer prices for wheat, barley and agricultural inputs. These policies have presented difficulties for privatization, and as a result, major policy shifts have been required in most countries to promote agricultural liberalization. For instance, Algeria made a policy change in April 1994 by liberalizing its agricultural policies through a reduction in the producer price support for cereals, pulses and other selected crops, an increase in interest rates, and a reduction in or the complete elimination of direct and indirect input subsidies.

2.3 Agricultural Research

While agriculture is the major user of land, water and biological resources (Bonte-Friendheim et al., 1994), and the rise in population and animal pressure in the region has increased competition for these resources. The rapid growth in urban population and industrialization is putting added demands on the fresh water supply and further limiting the possibilities of expanding cultivable land. Efficient agricultural research systems are therefore critical if sustainable food security is to be achieved in the Near East and North Africa region.

Given the agro-ecological diversity of the region, the constraints faced, and the location specificity of small-farmers production problems, the expertise research institutions can offer appears critical to increasing food production. The National Agricultural Research Systems (NARS), which work to increase agricultural productivity and profitability in the Near East and North Africa, will continue to play a major role in national and regional development. Most NARS in the Near East and North Africa are composed of various national agricultural research institutes, agricultural universities, private sector firms, NGOs and farmers' organizations. However, the role each institution plays in agricultural research varies from country to country. Furthermore, since the major agro-ecological zones in the Near East and North Africa are diverse, the type of crops grown, the technological input requirements and the major research objectives also differ within the region.

The International Agricultural Research Centers (IARCs) and their sub-regional centers also contribute to the development effort of the region. IARCs and their regional networks supply training facilities, information, technological packages and valuable seeds of newly developed varieties through their crop development networks. For instance, Turkey is collaborating on variety development with the International Maize and Wheat Improvement Center (CIMMYT) for wheat and maize, the International Potato Center (CIP) for potato, the International Center for Agricultural Research in Dry Areas (ICARDA) for wheat, chickpea, and lentil, the International Rice Research Institute (IRRI) for rice, and the International Center for Tropical Agriculture (CIAT) for dry bean. Libya receives germplasm mainly from CIMMYT, ICARDA, and the Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD) for evaluation. Governments in the region also receive strategic and policy advice from FAO to strengthen their research systems.

The major problem confronted by most NARS and IARCs in the region, especially in the 1990s, has been declining and unstable funding levels. Growing uncertainty regarding the stability of donor funding was highlighted at the World Food Summit and is recognized as one of the major constraints to future food security in the region and throughout the world. In this regard, national and regional political and financial commitments to investment in agricultural research have been recommended (FAO, 1996c). Another constraint has been that many of the national and international agricultural research programs in the region lack participatory approaches to incorporate indigenous knowledge of traditional production systems.

2.4 Agricultural Extension Services

Agricultural production has close linkages with extension. It is the responsibility of the extension services to provide advice to farmers regarding seed selection, treatment and storage, and to share information regarding the release of new varieties and to demonstrate their characteristics. Without an effective extension system responsive to farmers' needs, it would be difficult to develop a seed supply system, particularly an on-farm improved seed production system, which requires extension services. Extension can also serve as a feedback mechanism as agents are exposed firsthand to farmers' impressions on seed of improved varieties or technology.

In the Near East and North Africa, reports from 22 countries have shown that most countries have operating extension services that are carried out by both the public and private sectors. However, most of services offered by the public sector are less efficient mainly due to financial constraints, deficient transportation, lack of incentives to motivate extension agents, and lack of appropriate varieties that farmers find acceptable. Due to these constraints, many countries have limited the number of services provided by the public sector. For instance, in Jordan extension is limited to promotion of the use of good quality seed, whereas in Yemen extension services strictly offer technical assistance. In the private sector, NGOs are also active in agricultural extension.

The lack of efficient national extension services was mentioned by the majority of governments at the twenty-second FAO regional conference for the Near East as one of the major constraints to agricultural development in the region (FAO, 1994c). Jordan, Syria, Lebanon, Yemen, Morocco, Mauritania, Turkey, Afghanistan, and Pakistan specifically expressed the need to strengthen their agricultural extension services.

2.5 Availability of Agricultural Inputs

To maximize their genetic potential, improved seeds often require purchased inputs such as fertilizers, pesticide, herbicide, and irrigation water. In the Near East and North Africa, these commodities are generally imported, and therefore require substantial foreign exchange, the demand for seed is likely to be affected by their availability and price. In most cases, the public sector is responsible for agricultural development programs including the provision of agricultural inputs to farmers. Many governments in the region such as Egypt, Jordan, Lebanon, Morocco, Syria, Tunisia, and Turkey have adopted the policy of subsidies for some agricultural inputs, thus reducing the cost of improved seed production and increasing its use for higher productivity (Bishaw et al., 1997). However, the move towards a market-oriented economy in most Near East and North Africa countries is diminishing the role of public sector in agricultural development.

Changes in agricultural policies will inevitably impact the cost of crop production and may further reduce the number of farmers capable of affording the required agricultural inputs to maximize crop yields. Even now, the majority of farmers in the region, especially those working under marginal conditions have been unable to purchase inputs even when subsidized by the governments. However, it has been argued that the supply of inputs such as fertilizers is less critical than the benefits small farmers derive from improved seed, as long as the seed varieties offered are well-adapted to small farm environment and low input crop management practices of traditional production systems.

2.6 Quality Seed and Agricultural Development of the Near East and North Africa

The availability of quality seeds of a wide range of varieties and crops to farmers is one of the major keys for achieving food security in Near East and North Africa. Some of the direct benefits accrued to farmers from the distribution and use of good quality seed of improved varieties include enhanced productivity, higher harvest index, reduced risks from pest and disease pressure, and higher profits. Seed is also critical to the optimum use of natural resources and, according to its provenance and the breeding goal, seed determines the requirements for inputs such as pesticides, fertilizer and agricultural technology. When production increases through use of improved varieties in a given area, self-employment potential through processing, marketing, and related activities can bring about a general improvement in the quality of life.

3. SEED FOR FOOD SECURITY

3.1 Seed and Emergency Situations

Seed is mostly supplied in the Near East and North Africa by the informal seed supply systems whereby the farmer saves part of the harvest or exchanges with the farmers in the community. To a lesser extend, the formal seed supply systems delivers certified seed to some farmers on a regular basis.

There are situations where the supply of seed is interrupted, such as during ecological or large scale civil disturbance. In recent times, some countries in the Near East and North Africa have undergone frequent food shortages brought about by natural calamities as well as complex internal strife such as in Afghanistan, Iraq, and Iran, forcing the governments to spend their foreign resources to purchase food. Such situations place additional strains on economies and can cause tremendous economic setbacks. This situation has received the attention of several governments, donor community, and regional networks such as the West Asia and North Africa network (WANA).

Seed is one of the primary needs of farmers displaced because of war and natural calamities. In the past, most affected countries received seed aid based mainly on humanitarian grounds, often with little consideration of the seed variety and its quality aspects. While such assistance has benefited some countries in the short-term, especially in easing food shortages, the poor performance of untested seed material, severe genetic contamination or complete displacement of local landraces and farmers' varieties, can cause disruption of the informal seed sector and damage the traditional production systems of a country. In some instances, non-government organizations (NGO) and other donors have purchased food grain from neighboring countries and distributed the grain to farmers. This practice may introduce new problems of pests, diseases and weeds. Seeds brought in by relief operations continue to be distributed in disaster areas with little attention paid to the greater danger of genetic contamination and/or displacement of traditional varieties. Since most farmers in the Near East and North Africa save portion of their harvest as seed for the following year, this problem may continue long after the emergency and jeopardize the future national agricultural development and food security. Clearly, coordination is needed between emergency relief and long-term development assistance programs to avoid problems such as introduction of inappropriate crop varieties and pests.

Furthermore, national, regional, and global strategies are necessary to cope with emergency situations. If a region in a country is affected, as in the case of the civil war in Eritrea and Ethiopia, the rest of the country can supply the required seed, provided that national seed programs are well established. On the other hand, if the whole country is affected, the crop varieties can be supplied by other countries in the region or from the regional IARCs and international development agencies such as FAO, the World Food Programme (WFP) and UNDP, and NGOs. Such assistance can help the country resume its seed production without serious threat to the production program. However, as it has been the case in most emergency interventions, responses have been ad hoc and voluntary. There has been no standing capacity to respond appropriately to such disasters; no clear description of responsibilities, no co-ordinating mechanism to bring the various agencies and organizations together for planning and implementation of emergency seed supply during and following disasters. This increases the risk of supplying inappropriate seed and planting materials and jeopardizes the sustainability of future agricultural systems.

In response to these difficulties, the intergovernmental Leipzig Conference has given FAO the mandate to coordinate, in collaboration with the World Food Programme (WFP), the United Nations High Commission for the Refugees (UNHCR), the Office of the United Nations Disaster Relief (UNDRO), the International Plant Genetic Resources Institute (IPGRI), NARS, IARCs, regional plant genetic resources networks, governments of the countries affected, donor countries, and NGOs, programmes for rapid acquisition and multiplication, restoration and provision of seed to countries in need. The efficiency of this type of co-operation has been recently demonstrated in Afghanistan (Tunwar, 1996).

To become food self-sufficient, farmers should have on-going access to quality seed in normal and crisis situations. Viable seed supply systems to multiply and distribute the seeds or plant materials that have been developed or preserved are critical for the success of food security programs in the Near East and North Africa. Countries in the region should therefore develop seed security policies that assure a ready seed supply in the quantity and quality needed of acceptable/suitable varieties and which are affordable to farmers.

3.2 Irrigation and Infrastructure Improvement for Food Security

The rapidly growing populations in the Near East and North Africa are exerting immense pressure on the agriculture sector to expand and provide more food. However, rain-fed farming has already been pushed in most areas to the driest limits, and there are already difficulties in maintaining production in the existing agricultural area. The uncertainty of rainfall is one of the major causes for crop failures in most countries of the region. Therefore, to ensure stability in agricultural systems, it is imperative that countries develop land use management policies that promote soil and water conservation and other natural resource management practices. In addition, conservation programs are needed to harvest water from seasonal rains and exploit ground aquifers for small farmers.

Other alternatives include the development of irrigation systems. While Egypt, Iraq, Israel, Kuwait, Oman, Pakistan, and Qatar have over 80% of their arable land under irrigation, there are still many countries in the region such as Algeria, Mauritania, and Tunisia that have only under 10% of their total arable land irrigated (FAO, 1996). The FAO is well placed to use its technical and advisory services to help countries negotiate for water rights and assist countries in developing small, medium and large-scale irrigation programs, which could increase sustainable food production levels.

Without investment in water infrastructure supported by reformed institutions, the prospects for improving seed and food production are dim in the Near East and North Africa. Water control infrastructure should not be developed in isolation, but should be part of wide-ranging area development programs. At the design level, public authorities should be responsible for the construction and operation of dams, headworks and main irrigation and drainage canals, while farmers' associations or the private sector should be responsible for managing, and, when possible, building the on-farm distribution system. Obviously such schemes require large sums of money and innovative ways to finance irrigation.

The success of irrigated agriculture also hinges on appropriate technology. Inadequacies in market systems, storage facilities, management of agricultural produce and credit sources have contributed to failures in the past. These constraints can be overcome through sound government micro-economic policies designed to facilitate increases in production and to ensure the economic viability of projects.

Furthermore, costs of irrigation development can be reduced by employing national engineering and construction firms for the design and construction of projects and by contracting local manufactures to produce the irrigation material. Policies should encourage the development of a local irrigation industry, including a manufacturing base and servicing sector.

3.3 Plant Genetic Resources and Food Security

Crop development has for centuries depended on the utilization of gene pools that have evolved through natural selection in a multitude of diverse eco-systems. However, the genetic diversity of plant resources is rapidly being reduced in certain regions including the Near East and North Africa due to natural and human activity. Without a global effort to preserve biodiversity, there will be little that plant breeders can do to extract genes for incorporation into new varieties needed to withstand stresses and ultimately enhance the quantity and quality of food crops over the long-term.

Many international, regional, and national organizations have developed a global mandate to conserve genetic resources and minimize genetic erosion. The role played by the farming communities, including those in the Near East and North Africa, in the utilization and conservation of heterogeneous traditional varieties has been recently recognized by the world scientific communities as critical to the future of agriculture. Although many of these landraces have been lost through replacement of modern varieties in various agricultural systems, there are still ecological niches and remote areas in the Near East and North Africa where indigenous germplasm is nurtured and utilized.

In regard to the collection and conservation of plant genetic resources, apart from Turkey, few countries in the Near East and North Africa have well-functioning medium and long-term storage facilities. Pakistan and Iran have good long-term facilities while Egypt and Morocco have facilities with limited capacities. For instance, only forage and pasture species can be stored under long-term conditions (-18°C) in Morocco. Both Egypt and Morocco store accessions of other species in active collections and have proposed to create national genebanks. Active national collections are also found in Iraq and Yemen. In Cyprus, Syria and Tunisia efforts have been made by various institutions during the last decade to build medium-term storage facilities for the conservation of national collections. However, these facilities are hampered by maintenance problems that reduce their efficiency. In the other countries, ex-situ conservation activities are either poor-existent or in the process of being developed.

Field genebanks are also found in different parts of the Near East and North Africa, and are especially used to maintain collections of fruits, nuts, olives, garlic, and onion. The accessions stored in field genebanks throughout the region have been reported to be approximately 10,000 (FAO, 1996). Turkey has reported to have 12 genebanks for fruit trees at various institutions. However, lack of funds for maintaining collections is cited by many countries as the most common constraint to in-situ collections. In addition, most of the conserved materials are rarely distributed for use. Of the nine countries with national field genebanks, only Pakistan has a significant distribution of about 10% of material a year to national breeding programs. The IARCs are also contributing to the preservation and utilization of germplasm in the region. CIMMYT maintains 13% of most of the wheat ex-situ collection, and ICARDA holds 33% of the faba bean, 30% of the lentil, 15% of the chickpea, and 5% of the barley collections.

4. SEED SUPPLY SECTOR

The seed supply sector in the Near East and North Africa is mainly comprised of the formal and informal seed supply systems. The formal seed supply systems include public and private seed sectors. Seed certification and quality control services are generally provided by the public sector throughout the region.

The informal seed supply systems include indigenous strategies used by farmers to improve the quality and quantity of seed.

Most of the countries in the region are involved in international seed trade. Wheat, barley, potato, and vegetable crops are the most important crops for the seed market. Cotton and sugar beet seed trade is also significant in Egypt, Turkey, and Morocco. In all, seed exports are annually estimated to be around $ 20 to 30 million. However, seed imports are far larger than exports. The total value of imported seeds is estimated to be nearly $ 200 million, which represents roughly 7% of the total international seed trade (ICARDA and GTZ,1997).

4.1 Current Status of the Near East and North Africa Seed Supply Sector

The status of the formal seed supply system in the region varies from country to country. With regard to seed supply sector development, three distinct groups have been formed in the region (van Gastel, 1993). Morocco, Turkey, and Pakistan are examples of countries with well-developed formal seed supply systems, particularly in regard to cereals and to a lesser extent legumes and forages. These countries have seed laws and an operating certification system for the main crops, and varieties are carefully evaluated before release. Egypt, Jordan, Tunisia, and Syria are examples of a second group that includes countries with reasonably well-developed infrastructures for a few cereal crops such as wheat and barley. However, the production of seeds of other cereals and pasture and forage crops is limited. In these countries, seed quality control activities are considered weak and are only partially or not at all covered by official regulations. The last group comprises countries with virtually no formal seed supply system development. In this group, only a very small amount of seed of the most important crops is produced, and seed quality control activities are essentially absent. The seeds produced are highly subsidized and no seed laws and certification systems exist. In these countries, which include Yemen, Qatar, Kuwait, Oman and United Arab Emirates, often the quality seed only reaches the more developed, larger farmers.

Despite initiatives by a few countries such as Pakistan to launch on-farm seed production projects in the region, the informal seed supply systems have been generally left out of development efforts throughout Near East and North Africa. As a result, lack of quality seed of improved adapted varieties at the farmer-level is one of the most important constraints faced by the formal sector to increase productivity.

4.2 National Seed Policies

Many governments in the Near East and North Africa have recognized the importance of quality seed in contributing to increased agricultural productivity and production. The main seed policies of most governments in the region is to ensure the wider use of quality seeds. In the 1980's, efforts in improving the national seed supply systems focused on the public sector and relied heavily on subsidies for seed and agricultural inputs. However, due to the structural adjustment programs initiated over the past decade, the focus has switched to the private sector as governments' subsidies have been removed to encourage private sector involvement. Nonetheless, the high frequency of droughts and other environmental constraints have required continuing public involvement in the seed sector. Morocco, Egypt, and Israel, all have a comprehensive, well-defined seed policy. Cyprus and Turkey are countries which have a seed policy, but which does not cover all the components of the seed supply sector. There are also countries such as Iraq, Syria, Yemen, and Jordan, which lack a defined seed policy, but have seed plans within the national agricultural policy. Although these countries do not have clear seed policies, they do have special committees responsible for advising governments on general policy issues such as determining seed requirements, seed regulations, technical standards and control of seed trade. In Iraq and Jordan this organ is called the "Committee for seed of Agricultural Crops".

All countries in the region have some form of seed legislation. Generally, this is presented in two forms; seed laws or legislative acts and seed regulations or ministerial decrees. For example, Morocco, Egypt, Pakistan have a separate seed law with associated regulations, while Jordan, Cyprus, and Syria have seed legislation as part of the general agricultural law.

In those countries where a seed policy exists, it is generally designed to promote the formal seed supply systems. Although Egypt, Jordan, Lebanon, Morocco, Pakistan, Syria, and Yemen have claimed that their seed policies support the informal seed sector, only Pakistan has a clear policy on the development of the informal sector.

4.3 Seed Supply Systems

4.3.1. Formal seed supply systems

The formal seed supply systems in the Near East and North Africa are carried out for the most part by the public sector, but private companies are also involved especially in Jordan, Lebanon, Morocco, Pakistan, Tunisia, and Turkey. It is also common that seed supply systems are assisted by donor agencies in the region.

However, despite substantial assistance, the formal seed supply systems are currently not meeting more than an average of 10% of seed needs of farmers in the region. This is illustrated by the Seed Replacement Rate (Table 1), which is the ratio of the quantity of seed supplied by the formal seed supply systems over the total amount of seed required to plant the crop in a country for a given cropping season.

Table 1 - Seed replacement rate of main cereal crops in some countries in the Near East and North Africa

Country	Crop	Theoretical seed Requirement (t)	Seed Supplied by the Formal Seed Sector (t)	Seed Replacement Rate (SRR)
Algeria	Wheat	204,000	130,000	63.7
	Barley	165,000	31,400	19
Jordan	Wheat	7,680	5,442	70.86
	Barley	9,150	1,583	17.3
Mauritania	Maize	225	3	1.33
	Rice	18,400	54	0.29
Morocco	Wheat	366,000	73,790	20.1
	Barley	387,300	431	0.1
Pakistan	Wheat	966,960	77,697	8
	Rice	210,700	2,662	1.3
Syria	Wheat	186,360	162,665	87.2
	Barley	284,100	13,812	4.8
Turkey	Wheat	1,152,000	113,152	9.8
	Barley	510,000	10,839	2.1
Yemen	Wheat	12,000	992.4	8.2
	Sorghum	4,480	37.8	0.08

Source: FAO, 1995. Yearbook Production; Ahmad, 1995, Balikcioglu, 1996; Zentani, 1995; Hussein, 1996; Country Reports; Madaratti and Sayed, 1995.

The figures presented in Table 1 show that only a small portion of the seed required is produced by the formal seed supply systems. Furthermore, the low rates highlighted in the table include only the main cereal crops, as few initiatives have been undertaken in other food crops such as legumes, arid and semi-arid crops, and vegetatively-propagated planting materials. In addition, the figures do not include seed export, which would further reduce the estimation of seed covered by the formal seed supply systems.

Seed research and variety development. Although programs vary widely in essence and content, the primary agricultural research activities in most countries in the Near East and North Africa involve variety development, testing throughout the country, release and registration, variety maintenance and breeder seed production. Plant breeding, the source of modern varieties, is the backbone of the formal seed sector and is exclusively a government undertaking in almost all countries in the region. As a result, there has been little demand in the past for Plant Breeders' Rights (PBRs), except in countries such as Morocco, Turkey, and to a lesser extent Pakistan and Jordan where the private seed sector has been involved in plant breeding. However, due to the recent need to involve the private sector in most activities of the seed supply sector, there has been a growing demand for the introduction of PBRs throughout the region. As a result, most countries have been either preparing or re-enforcing their Plant Variety Protection Acts despite the fact that many countries have objected to the privatization of some activities including the breeding of strategic crops and variety testing and release for all crops (Bishaw, et al., 1997).

The IARCs and their regional networks are also major contributors to all aspects of variety development research, training, and information dissemination on improved genetic material. Most national breeding programs utilize advanced breeding lines provided by the IARCs and their regional programs. Syria, Morocco, Qatar, and Libya have also mentioned the Arab Center for Studies of Arid Zones and Dry Lands (ACSAD) as one of their sources of advanced breeding lines. Technical advice, infrastructure development, and research management skills are also provided by international agencies.

The problems that face most national seed research and variety development programs can be summarized as follows:

(i) as reported by 41% of countries in the region, there is a limited level of technical competence and lack of trained technical staff in areas vital to plant breeding. As a result, the public sector strongly rely on expatriate technical assistance in plant breeding;

(ii) variety evaluation procedures used in many countries in the region except for Turkey, Egypt, Morocco, and Tunisia are considered to hamper the release of superior varieties; and

(iii) despite the efforts made by most NARS and IARCs to provide improved varieties to farmers, there is a general lack of good seed varieties adapted to marginal land areas in the region.

Hybrid seed development. The public seed supply sector still plays a significant role in hybrid maize breeding, producing 49% of all the hybrid maize seed sold in the region. In particular, Turkey and Morocco have relatively effective formal seed supply systems for maize hybrid seed production. CIMMYT has trained plant breeders and provided several countries in the region with germplasm required starting maize hybrid seed production programs.

The use of hybrid seeds have increased in recent years. For example, in 1993, 87% of commercial maize seed sold in the Near East and North Africa was hybrid seeds (CIMMYT, 1993). Hybrid vegetable crops are also being used in many production systems in the Near East and North Africa (FAO, 1995). In the case of vegetables, however, multi-national seed companies produce and supply hybrid seed from Europe. Only Jordan has a substantial production of its own vegetable hybrid varieties in the region.

Biotechnology application. Resources such as arable land and water are limiting factors in the Near East and North Africa and extreme climate and land degradation put severe constraints on agricultural systems. Every possible avenue to increase crop productivity and food availability has to be sought. In this context,

Copyrighted Material

the use of recent advances in biotechnology could be helpful in increasing food production in some situations. There is already much interest in biotechnology and public sector programs are at various levels of development. Algeria, Egypt, Iraq, Jordan, Libya, Morocco, Saudi Arabia, Syria, Tunisia, and Turkey have been applying some biotechnological methods (mainly tissue culture) within the last 5 years. However, except for a few countries that have commercial applications such as Morocco, Turkey, and Israel, most of these programs are still at the experimental stages, and programs are already plagued with serious funding limitations and a lack of trained staff.

Without external assistance, efforts in biotechnology may not be sustainable. Some international organizations have been offering assistance in the application of advanced plant biotechnological techniques. For instance, FAO has been working in Iraq, ICARDA is assisting Syria, and the UNDP has been assisting Egypt and the United Nations Industrial Development Organization (UNIDO) has been working with the countries of Egypt and Kuwait. Japan has been active in improving the biotechnology capacities of the United Arab Emirates and Qatar.

Most biotechnological research carried out at universities and through research centers are confined to the country itself. Interaction and regional cooperation between institutions and private industry dealing with biotechnology could maximize resources and reduce costs. Furthermore, most institutions involved in the application of plant biotechnology have not been involved in formulating national policies, and only a few countries have national plans for biotechnology development.

The adoption of improved varieties in the region. While the adoption of improved varieties varies from country to country and from one crop to another, few farmers living in marginal land areas of the Near East and North Africa have adopted improved varieties produced by the NARS and the IARCs in the region. Despite substantial efforts by governments to produce improved crops, especially cereals, the regional average of areas grown with improved cereal varieties is estimated at 60% for wheat, 38% for barley, 48% for rice, and 25% for maize (Sgaier, 1993). The percentage is even lower for vegetables and pulse and feed crops. For instance, Turkey has 10% of the total vegetable crop area under improved varieties, and Afghanistan has only 3.9% cultivated under improved varieties. Concentrated efforts at the national and cultural, regional and international levels to increase the use of quality seed are therefore essential.

The adaptation of new technologies including improved crop varieties is usually influenced by socio-economic factors. In the Near East and North Africa, these factors can include among others, size and grouping of families (extended or single family system), financial status of households, access to inputs, credit and markets, price ratios, and land tenure systems as well as farmers' traditional preferences and labor requirements of the new variety. Due to the economic status of resource-poor farmers in the Near East and North Africa, the high cost of seeds of improved varieties often discourages their use. In addition, seed traders in the region usually increase prices to avoid losses incurred when seed lots retained by traders cannot be sold. Therefore, economic policies that are favorable to farmers should be carefully designed to promote the use of improved varieties by farmers. These policies include realistic exchange rates, remunerative prices to farmers for their produce (the risk element of producing a particular crop must be taken into account), and a set of other policies, which reduce the risks associated with farming.

The availability of credit to farmers has been considered by many governments in the region to be critical for the adoption of improved varieties by small farmers. However, results from a survey conducted in Pakistan found that the availability of credit is not a significant factor affecting the adoption of improved seed by small farmers. The study concluded that the agro-climatic adaptation of the variety, including yield superiority and sensitivity to planting date, and socio-economical factors such as farm size were more critical variables (Heisey, 1990).

A need assessment of limited resource farmers is necessary before new varieties are developed and introduced. Such a study could provide information on the needs and resources of the farmer and the climatic and edaphic conditions of a particular target area. The survey could also guide policy makers in their decisions that would favor the on-farm production and utilization of improved varieties by farmers.

Seed production systems. While seed production in the formal seed supply systems of the Near East and North Africa differ from country to country, many systems follow similar principals. In general, seed production requires a stepwise process, which is vertically organized. It starts with pre-basic seed developed from a national or international research system. The pre-basic seed is increased to basic seed, which in turn is multiplied into registered seed from which certified or uncertified commercial seed is produced and sold to farmers. There are a series of regulations and procedures to be followed from one multiplication cycle to the other, and technical competence of the seed industry staff is important throughout the production cycle. Seed producers are required to have a good knowledge of the crop and its phenotypic and genotypic traits.

Improved seed is required to go through a series of seed handling processes before it reaches the growers. These processes which include seed processing, distribution, and marketing require a certain level of seed standards.

There are few countries of the Near East and North Africa that have developed good seed processing facilities. In most countries, seed processing facilities are distributed throughout the country, but in Libya the most important of the cereal seed processing plants are in the desert (Zentani, 1995, Mission Reports). Seed packaging is usually done in bags of 25, 40, 50, and 100 Kg. For instance, Morocco uses 100-Kg bags for wheat and barley, 50 Kg for potatoes, and 25 Kg for maize (Mission Reports). Common problems in seed processing and distribution are related to the malfunction of the processing plants, contamination from different source seeds, and a break down in the seed supply system due to transport problems. Adequate management is needed to successfully operate processing plants, and training of technicians is crucial across the region if the seed produced by the formal sector is to reach the standards expected (Sgaier, 1993).

Another vital aspect of the seed industry is the function of conditioning and storage, which must be adequate to preserve the physical characteristics of the seed specified by regulatory standards. For storing certified and lower grade seed, less rigid principles need to be followed. Seeds should be naturally or artificially dried to the moisture content recommended for each variety and stored in well-ventilated, low humidity facilities. These parameters, if met properly, are adequate for short-term storage. Egypt, Turkey, Morocco, Israel, and Jordan where there is a strong presence of private seed industry, have good storage facilities. However, the storage facilities in other countries of the Near East and North Africa are generally inadequate. To enhance storage conditions, Libya stores its surplus seed in desert areas, and Yemen stores all its wheat seed and some other cereal seed in the highlands where humidity is lower (Zetani, 1995; Hussein, 1996). On the other hand, due to problems in transporting the seed from storage facilities to arable farming areas, these decentralized schemes are causing an increase in distribution costs. However, despite a favorable climate for storage and good storage facilities, Egypt has estimated losses of up to 20% of seed in some crops under the Principal Bank for Development and Agricultural Credit (PBDAC) storage facilities (El-Wanis, 1995).

Most seed companies in the formal seed supply systems have their own channels of seed distribution. The public sector usually has outlets in areas where they are most active. Seed should be supplied to these outlets before the beginning of the growing season. Village cooperatives and commission agents are used for seed distribution and are paid a certain percentage for handling charges.

The major problems confronted by seed distribution systems in the formal seed supply sector are related to transport and handling of the seed. In many countries of the region, seed marketing is also a weak link in the seed-production chain, limiting farmers' access to seed. On the other hand, private seed industries, which have a business approach to seed production and distribution, have improved the seed marketing network in some countries such as Egypt, Turkey, Morocco, Israel, Pakistan and Jordan. Marketing of imported vegetable seed is a well organized operation of the private sector in Jordan and has been marginally successful in a few countries such as Turkey and Egypt.

It may be beneficial for countries that are striving to increase their activities in the international seed trade to be effectively involved in the international seed organizations including ISTA, the Organization for Economic Cooperation and Development (OECD), the International Seed Trade Federation (FIS), and Union for the Protection of New Varieties of Plants (UPOV). However, in the Near East and North Africa only Morocco, Tunisia, and Turkey, and to a lesser extent, Cyprus and Iran, are considered to be members of the international seed organizations. The remaining countries are partially or not at all involved with these organizations. Lack of cooperation with international seed organizations may decrease countries opportunities for export of seeds, thereby limiting the needed private sector involvement in the seed supply sector.

Government investments in rural infrastructure and general agricultural policies, which are generally determined in most the Near East and North Africa countries independently from the needs of the seed supply sector, can indirectly exercise a profound influence on the growth and structure of the seed supply sector. Investments in rural roads, markets, and storage facilities can substantially reduce the cost of producing improved seed by decreasing the transportation, processing and distributing costs.

4.3.2 Informal seed supply systems

The informal seed supply systems is comprised of farmer managed seed production activities and is based on indigenous knowledge and local diffusion mechanisms. It includes methods such as retaining seed on-farm from previous harvests to plant the following season and farmer-to-farmer seed exchange network (Cromwell et al., 1992).

There has been little or no emphasis on the informal seed supply sector and little is known about its operation in the region. As a result, documentation with regard to the informal seed sector is scarce. For the purpose of this assessment, the information was collected through reports generated by experts who visited the region and documentation from some countries such as Pakistan, Mauritania, Afghanistan, Morocco, Syria, Egypt, Tunisia and Turkey.

Despite more than three decades of investment in agricultural research and formal seed supply systems by bilateral and multilateral organizations, more than 90% of seeds used by farmers in the Near East and North Africa are still being supplied through the informal systems. The reasons for high this reliance on the informal systems by farmers for their seed supply are multiple and varied and depend upon country, farming community, and crop. However, some major reasons can be summarized as follows;

(i) it is difficult, under the prevailing conditions of most countries of the Near East and North Africa, for the formal seed sector to reach every farmer in the region; and

(ii) most improved varieties produced by the formal seed supply systems are targeted at the few better endowed farmers living in areas where rainfall, irrigation and other means of production are easily available. The varied needs of the majority of farmers working in marginal land and those living in more remote areas and not easily reached are seldom met.

Due to prevailing farming practices, specific requirements of the macro- and micro-ecosystems, and the socio-economic situation in most rural areas, most farmers must act as plant breeders and select their own traditional varieties. In the informal seed supply systems, seeds and planting material are either shared or sold to neighbors at low prices. Although the seed quality, both genetically and physically, may not be as high as those in the formal seed supply systems, the advantages of low price, adaptability and easy access to seeds of traditional varieties substantially offset the difference in quality. Therefore, the informal seed supply system remains the most important source of seeds for most farmers throughout the region.

It should be noted that although farmers' varieties usually have better adaptability and tolerance to biotic and abiotic stresses compared to many of the available improved varieties, these qualities tend to degrade with time. It is therefore clear that unless action is taken to strengthen the informal sector in on-farm seed production, handling and storage, the majority of farmers in the Near East and North Africa will continue to be denied the benefits of modern crop improvement programs.

Due to the prevailing conditions in most of the Near East and North Africa countries, farmer-based seed production efforts appear to be critical for developing effective seed supply systems. Advantages to this model are its simplicity and cost-effectiveness. An effective on-farm seed production system would require that:

(i) surveys be conducted to identify the biological, social, and economic factors of the varieties important to farmers;

(ii) breeders collaborate closely with farmers on such seed production programs;

(iii) local germplasm be collected for long-term storage in genebanks for future multiplication and use in production; and

(iv) seed legislation take into account the low level of technology and minimum quality control procedures that are practiced at the farmer-level. Assistance by the FAO to governments in the region may be needed for the development of legislation.

When seed program initiatives are implemented in harsh environments it may be difficult to reach target population if unexpected calamities occur. Adequate safeguard measures often cannot be made in time to protect the seed and planting material. In order to avoid these risks, some remedial measures should be taken:

(i) areas with some assurance of irrigation or adequate rainfall should be selectedand farmers from such areas trained to produce seed;

(ii) the quest for short-season and drought resistant varieties should be the focus of plant breeders, using the genetic material from already existing landraces and other appropriate sourees of (disease and pest resistant) germplasm;

(iii) as has been done in some Asian countries, farmers should be kept informed through radio and other mass communication systems of early waming of sudden weather fluctuations. Mass media can also provide advice on crop management;

(iv) with investments and support from rural development organizations, every possible water source should be developed;

Copyrighted material

(v) farmer groups should receive training on a regular basis, to assure the sustainable on-farm production of high quality seeds; and

(vi) local banks and other lending organizations should be approached to provide credit as an incentive to farmer groups interested in on-farm seed production.

In the informal seed supply systems in the Near East and North Africa, seed distribution operate mainly, but not exclusively, between households within communities. However, lines of supply have been observed in some countries to be extended over a relatively wide geographical area (Cromwell and Wiggins, 1993). Under this type of seed distribution scheme, a wide variety of exchange mechanisms are commonly used to transfer seed between individuals and households including cash sales, barter and transfers based on social obligations. The quantities of seed exchanged in the informal seed supply systems are often very small compared to amounts traded in the formal sector organizations.

In the formal and informal sectors, seed promotion and extension is an important component of the marketing system. To sell a product, it must first be preferred by the users, attractively displayed, available at times the farmer requires, available in quantities needed, and correctly priced. Critical to marketing are programs to educate farmers about quality seed. Demonstrations, field days, and farmer-to-farmer field visits can be used to raise awareness among farmers. It is encouraging to note that countries in the region are increasingly realizing the advantages of a good distribution and marketing strategy.

A system of improved on-farm seed production has been described and adapted in some Near East and North African countries. In this system, the researcher's involvement terminates at the foundation seed stage. The seed is sold to farmers who take over the function of multiplication, harvesting, drying, processing, storage and marketing. The seed processing is usually done manually at farm-level, and the commercial seed is sold as 'truthfully labeled seed" to other farmers. Such seed normally conforms to all the technical standards required in the notification of a variety, although it is not certified. A farmer-based model of this type is especially suitable for the production of vegetatively-propagated planting material for root and tuber crops. Farmers could also improve the management of open-pollinated crops once some training is given on the various aspects of on-farm seed production.

4.4 Integrating the Formal and Informal Seed Supply Systems

Integration of the public and private seed sectors has been essential for the successful development of the seed industry in several countries of the Near East and North Africa. A similar integration of informal and the formal seed supply systems is critical to the development of sustainable seed supplies necessary for the level of agricultural productivity needed to feed the growing population in the region.

Due to poor performances by most formal seed supply systems and to demands of structural adjustment programs, most Near East and North Africa governments are presently cutting subsidies to the seed sector. As a result, government involvement in providing agricultural inputs, marketing, and research and extension services is being reduced. These changes have led to a greater emphasis on privatization of the seed supply sector (van Gastel et al., 1997). However, because it is not economically viable, private seed companies do not produce seeds for subsistence crops or for farmers living in marginal land areas.

In response, some NGOs have engaged in seed projects to enhance the ability of traditional communities to produce and distribute on-farm seeds, especially in Pakistan, Egypt, and Mauritania. Such initiative should be promoted and the formal seed supply sector, which has technical expertise in seed production, should also be involved in strengthening the effectiveness of NGO activities by improving their technical seed production capacities and providing logistical support to on-farm seed production programs (Cromwell et al., 1993).

Without collaboration between the formal and informal systems it will be difficult to achieve substantial improvement in seed production in most countries in the Near East and North Africa. Collaboration is also fundamental to the preservation of farmers' traditional varieties and protection of indigenous germplasm from genetic erosion.

4.5 Linkages in the Near East and North Africa Seed Supply Systems

Research, extension, input supply services, distribution and marketing are some of the major component that determine the effectiveness of any seed supply system. The neglect of any one component in the seed development chain affects the entire seed supply system. Furthermore, changes in policies of one component may have adverse effects on the performance of others and jeopardize the development of an emerging seed supply system. Some examples of what may result when linkages are not adequate are:

(i) new varieties may be produced by agricultural research institutions, but do not have the attributes required by farmers;

(ii) distribution channels for improved seed may have suitable varieties available but fail to reach small farmers in a timely manner, at affordable costs, or at accessible locations;

(iii) distribution channels for complementary inputs may be ineffective; and

(iv) extension services or agricultural credit institutions may fail to provide the necessary support to farmers.

All the above points could lead to low adoption of improved seeds, thus affecting the development of a seed supply sector.

The majority of seed programs in Near East and North Africa have been promoting seed system development independently to research capabilities, extension services, rural infrastructure, and farmers' socio-economical conditions. It is also paramount that linkages in seed supply systems be considered when defining seed strategies that are best suited for a country. In addition, it is important to be aware of potential negative repercussions to the seed supply sector if changes in other policies concerning services offered to farmers occur.

5. THE WAY FORWARD: OPPORTUNITIES FOR IMPROVEMENT

The seed production and supply systems in Near East and North Africa are at various levels of development. Since the informal seed supply systems have been generally excluded from development initiatives, variations among countries are mainly in the formal seed supply systems. The majority of countries have reasonably functional formal seed supply systems for the most important cereal crops, but only few could claim well-operating formal seed supply systems. However, in all countries seed production of other cereals, vegetable crops and pasture and forage species is underdeveloped. Initiatives in on-farm seed production are underway in some countries, but progress in this area remains generally modest.

Issues related to seed have in recent years become increasingly more important and more complex and multidimensional. Seed supply systems cover not only seed, but also plant genetic resources. In most countries of the Region, seed related issues are the subject of ongoing debate among policy-makers, professionals, farmers, farmers' organizations and investors.

Production and food security dimension. Seeds are the single most important input in crop production. They carry the genetic potential of the variety and determine the ultimate productivity of other inputs. The main role of other inputs in crop production is to exploit to a maximum the genetic potential of seeds. Therefore, seeds are and should always be the basic element of any food security scheme.

Trade and legislation dimension. It is estimated that the value of seed import in the Near East and North Africa alone is about US $200million, with hardly any export. With the advent of the Uruguay Round Agreements and their impact on the international trading system, countries are obliged to review their national regulatory legislation in the relevant sectors. A number of these agreements have direct impact on the seed systems.

Liberalization reforms dimension. Privatization is touching practically all sectors in the Region with agriculture and the seed sector being no exception. In many countries it is no longer a question of whether or not to privatize the sector, it is rather a question of when and to what extent. The move towards privatization will require wide-ranging reforms and policy adjustments on the part of governments.

Emergency rehabilitation of disaster areas dimension. Provision of seed in emergency situations constitutes a major first step in the rehabilitation of agriculture in most of the stricken areas. Due to a lack of seed stocks and poor infrastructures, countries rely on donations of seed from outside the country. In many cases this can bring many problems including - pests, diseases, and unsuitable varieties.

In collaboration with other organizations and donor agencies (e.g. DANIDA) FAO has spearheaded efforts to build viable national seed systems in developing countries to develop international guidelines needed to regulate production and movement of seeds (Kelly, 1989). While some of the factors and problems, which have hampered seed sectors development in the past, still persist, the situation now is compounded by the emergence of new concerns, discussed above. Policy makers are facing new challenges and problems that require changes in policies and strategies.

5.1 Constraints to Seed Sector Development

Factors impeding development of the seed sector in the Near East and North Africa are all inter related and therefore demand attention if high quality seed production and utilization is to be achieved. Instability of climatic conditions, particularly fluctuation in rainfall, is among the chief factors seriously affecting seed production in the Region. Other factors contributing to poor seed production include weaknesses in the agricultural research and extension systems, outmoded production and processing facilities and lack of trained personnel. Furthermore, the use of farmer-saved seed and farmer-to-farmer seed exchange has considerably reduced the actual demand for certified quality seeds.

While some of these constraints are directly affecting the productivity of the seed sector, other limiting factors are related to policy measures. The following sections divided into production- and policy -related constraints outline limitations in the Near East and North Africa seed supply systems.

5.1.1 Production and supply-related constraints

Variety development. Variety development is the foundation of any seed supply program. Based on country data and findings reported by experts who visited the Region, constraints in variety development can be summarized as follows:

(1) Lack of organized programs for breeding and release of new varieties in several countries. Even in countries with good crop improvement programs, there still exists a shortage of good varieties adapted to marginal and rain-fed farming areas;

(ii) Imbalance in variety development as a result of plant breeding and variety development programs being limited to a few crops, principally wheat and barley. Despite their importance in the local diet, grain legumes, vegetables, and forage crops receive less attention, if any, compared to cereals;

(iii) Prolonged variety evaluation procedures commonly used in the region often limit the release of superior varieties; and

(iv) Poor maintenance of varieties after they are released often leads to rapid deterioration and a sharp decline in farmer confidence.

Low adoption of improved varieties. To date, the adoption by farmers of most improved varieties produced in the region has been low, thus slowing the development process of the seed sector. Adoption of new varieties in the Near East and North Africa has been constrained by:

(i) Lack of breeding objectives, which correspond with the needs of farmers. The major breeding strategies have in the past concentrated on increasing yield potential through fertilization, crop protection, and the development of resistance characteristics. Variety adaptation to the cropping systems of the farmers, their storage methods, and the biotic and abiotic stresses (this often has high priority for small farmers in the region) are seldom addressed. Furthermore, farmers often have specific culinary, organoleptic, and other culturally specific requirements that have rarely been taken into consideration by breeders;

(ii) Low adaptation of the new varieties to most farmers' conditions. The selection process for these new varieties is carried out under high input conditions and is, in many cases, outperformed by the traditional varieties under low-input management systems common to most farmers; and

(iii) Lack of on-farm variety testing for farmer evaluation.

Rural infrastructure. Rural road networks and irrigation projects are critical for the development of seed supply systems of the Near East and North Africa. There is an insufficient rural road network in many countries of the region and, as a result, it is difficult to transport seed from processing plants to farmers. On the other hand, poor road conditions also prevent farmers from marketing their produce, which adds to food insecurity.

Low availability and high value of land. Arable land is scarce in most countries in the region and the value of land and labor is high. Land scarcity, which increases the cost of seed production, was indicated by several countries as being the most restricting factor to seed development. The lack of land has also been one of the major constraints to private involvement in seed production and has prevented many farmers and private companies from getting involved in on-farm seed production in these countries.

Erosion of plant genetic resources. Nearly all countries recognized in their Country Reports that plant genetic erosion is a serious problem in the Near East and North Africa. According to these reports, plant genetic erosion is caused by the replacement of local varieties by genetically uniform high-yielding varieties, by population pressure; by overgrazing, and by environmental degradation. The loss of traditional varieties, which have diverse characteristics, is reducing the gene pool available to breeders. Therefore, governments must institute strategies for the conservation of plant genetic resources. However, it should be recognized that the conservation of germplasm by itself is of no value if it is not used to develop new products and varieties, which will increase the yield of crops.

Lack of seed security stocks. Most countries of the region lack strategic reserves for use in emergency situations. In some countries, the storage of seed reserves is carried out in central locations by parastatal seed agencies, but only for wheat and barley and for a small percentage of the total seed requirements of farmers. Infrastructure for the storage of seed security stocks at a centralized and decentralized level should be established. This can help to avoid the disruption of agricultural production and loss of local genetic material due to natural and man-made calamities.

5.1.2 Institutional and policy-related constraints

National seed policies are institutionally rather than farmer based. As is the case in most developing countries, national seed policies in most countries in the Near East and North Africa have been designed to promote national seed industries. Seed policies seldom focus on the informal seed supply systems developed by rural farmers who are often only considered as end users rather than producers.

Seed policies are outdated in most countries. Although agricultural conditions in the region have changed considerably in the past decades, national seed policies remain the same. As agricultural sectors of a country or region develop, seed policies should be modified to reflect these changes. Changes may be related to policies in other areas of agricultural production, services in the seed sector, the infrastructure system and other factors affecting seed systems.

Poor linkages between the sectors involved in seed production. Most seed programs and donor interventions in the region have concentrated on promoting a seed production component. In addition, the long-term effectiveness of seed programs depends on the coordination of the various sectors involved including research, extension, seed production, the infrastructure systems, as well as farmers' participation. While in the past little attention has been given to ensure the cohesiveness of these various components, efforts must be made to strengthen seed production activities

Lack of or inefficient structures responsible for the planning and production of seeds. Most countries either lack a national structure responsible for the planning and production of seeds or have different units in relevant ministries to carry out seed activities. In situations where multiple institutions are involved in the planning and production of seeds, effective coordination of the various institutions and activities becomes a major undertaking.

Inefficient extension services in most countries. Due to financial constraints, poor transportation, and lack of incentives to motivate extension agents, extension services are relatively ineffective. Lack of adequate extension information is one of the main reasons for the low adoption rates of improved varieties. Extension should play a crucial role in training farmers in on-farm seed production and is therefore a prerequisite to the improvement of the informal seed system. Extension could raise awareness among farmers regarding the merits of the improved seed being introduced and work towards improving the ability of farmers to control the quality of seeds. A study conducted in Pakistan among farmers who adopted a new wheat variety revealed that 58% of farmers learned about the variety from other farmers, 24% from extension services, 8% from seed depot, 8% from radio, and 2% from other sources (Heisey, 1990).

Lack of trained personnel. In the country reports, most countries in the Region viewed the lack of trained technicians as one of the major constraints to the development of their seed supply sector. This situation is attributed to a lack of resources and funds; in suitable facilities and institutions; a high attrition rate of trained staff; poor training materials; and technical staff in the region involved in seed production, testing, processing and storage often have inadequate training.

Absent or inadequate seed laws and regulations in many countries. Seed legislation is non-existent in many countries while in others it is either outdated or not enforced. For example, seed quality control is operational in a number of countries although only for some crops and for a small percentage of the total seed production. In the rest of countries the seed control system is inadequate or non-existent.

Deficient pricing and marketing policies in some countries. In many countries of the Region, seed marketing remains one of the weakest links in the seed supply chain, thus limiting farmers access to seed. Most countries support the involvement of private seed dealers to distribute certified seed including seed for important food crops. However, there are many countries in the region where seed prices are fixed and subsidized by the state. This approach to seed sales has made seed production financially unattractive to the private industries. There are still varying opinions within seed sectors and among countries on whether seed of important food crops should be subsidized.

Inefficient seed distribution by the public sector. Despite efforts by NGOs to supply seeds to farmers in remote areas, the poor transportation infrastructures in most of the countries in the Near East and North Africa has been a major obstacle to the distribution of seeds. Farmers and local distributors participating in seed distribution have been observed to improve the availability of seeds to farmers. However, in the majority of countries where farmers are involved in seed multiplication, they are generally involved as contract farmers not as seed producer-sellers.

Lack or weak collaboration within seed sectors and between countries. Communication among institutions involved in seed sector development within a country and between neighboring countries is crucial for the development of seed industries. There is a strong need for information transfer and sharing of lessons learned between institutions involved in the seed sector, which can be achieved through national and international networking. Activities may include the organization of conferences, workshops, and seminars. These activities may facilitate the establishment of linkages within and among countries of the region for the future exchange of information and research collaboration. With communication channels formulated, countries can learn from each other's experiences and adapt strategies according to their specific country's' conditions. Furthermore, these networks can contribute to the formulation policies relating to the seed sector for the benefit of each and every participating country. In this regard, WANA has been established. Additional information may be obtained from the FAO Seed Review (FAO, 1994a) and other sources (FAO, 1996d).

Low involvement in international seed trade organizations. For countries that wish to be involved in international seed trade, it is important to establish ties with international organizations such as ISTA, FIS, UPOV and OECD dealing, respectively, with seed testing, seed trade, variety protection and seed certification. Most countries in the region are not members of these organizations.

5.2 A Call for Action

Given the present status of the seed sector in the region, it is clear that a major effort is needed to strengthen national capacities for improved seed production. Action is required at different fronts with the full participation of all stakeholders both in the public and private sectors and especially farmers and their organizations. The development of a national seed sector, which is primarily the responsibility of governments, would require co-operation based on comparative advantages among countries in the region.

To guide future development of seed supply systems in a country, it is first necessary to evaluate their existing systems. An evaluation should focus on the general socio-economic status of the farming community, the level of development of the seed supply systems, and the existing infrastructure. The outcome of such a study, along with the consideration of major seed policy issues such as those elaborated in this document, could provide important guidelines when formulating policies and strategies for the development of national and regional seed supply systems.

5.2.1 Guiding principles

It is of paramount importance for countries in the Near East and North Africa to create conditions conducive to the development of both the formal (public and private) and informal seed supply systems. Most governments have invested significant resources in the development of their formal seed supply systems. For instance, the public sector has been extensively involved in variety development and seed production. However, the informal seed supply systems remain grossly neglected. It is, therefore, imperative that governments improve the linkages between the formal public and private sectors, variety development and seed production, and the informal on-farm and community-based seed systems (Jaffee and Srivastava, 1992).

It is generally accepted that some degree of privatization in the seed sector is inevitable, but there are issues and questions that should be carefully considered by national authorities prior to privatization. These include the protection of the interests of small farmers, especially those living in harsh environment areas, as their main subsistence commodities are unlikely to generate effective demand to warrant private investors' interest. In areas where the private sector has a comparative advantage in relation to the public sector, any change in responsibility from the public to the private sector should proceed gradually. It should also be recognized that privatization requires administrative and legislative adjustments as well as different professional talents and managerial skills.

There is relatively little known about the informal on-farm seed production systems throughout the region. Despite the fact that they are responsible for providing more than 80% of the seed produced in most countries of the region, the informal seed supply systems have been left out of government or donor efforts geared towards improving the seed sector in general. Governments should recognize the importance of the informal seed systems and introduce policies and necessary actions to stimulate their growth.

Policy makers responsible for seed development in the region recognize the advantages of regional co-operation in achieving the development of national seed sector. In this regard, the on-going efforts carried out to enhance regional co-operation in seed production by ICARDA, FAO, and others are highly appreciated in the region. Nonetheless, additional opportunities for collaboration should be explored at both regional and sub-regional levels. For instance, a number of areas in seed supply systems that require regional collaboration have already been identified by policy makers.

Promoting seed systems development requires the establishment of legal and economic environments that attract a broad range of stakeholders in seed supply systems. Therefore, policy makers in the region have an important and complex task to identify rules and regulations that promote the development of seed supply systems (Tripp and Louwaars, 1998).

There is a considerable need and to expand the production of high quality seed for major crops for which current national capacities are generally limited. For example, breeding work for food legumes in the region has received less attention than cereal. This has resulted in a lack of good food legume cultivars. The same also applies to pasture and forage species. It is reported that very few countries in the region are able to meet 10% of seed requirements of pasture and forage species. Also, despite favorable soil and climatic conditions for vegetable crop production in some countries, the availability of quality vegetable seeds are limited. This availability of vegetable seeds varies with species and cultivation systems.

5.2.2 Elements for a Plan of Action

Countries vary in their farming systems, market-state of development, research capacity, and political organization. There is no uniform direction for seed system development for the entire region (Tripp and Louwaars, 1998).

In the following section, a wide range of actions and measures to improve the performance of the seed sector are recommended. Obviously, these actions and measures do not necessarily apply equally to all countries in the region. It is therefore up to each country to adapt these recommendations and develop policies, reforms, and actions appropriate to their specific conditions.

Facilitate a greater private sector involvement in areas where it has comparative advantage. In dealing with privatization and the question of how to proceed, three points need to be considered. First, the liberalization of the seed sector should be a carefully staged process. Any change in the public sector involvement in activities such as variety development, seed production, seed processing and marketing should be gradual and selective. Second, it should be recognized that on the part of government, privatization requires, considerable adjustments in administration and legislation. Third, privatization requires different skills and managerial approaches.

Define clearly the respective roles of the public and private sectors and strengthen coordination between them. While the public sector in the Near East and North Africa has been extensively involved in variety development, most governments how recognize the critical need for the participation of the private sector involvement in plant breeding. In an effort to increase private sector activities, it is essential to;

(i) develop legislation encouraging private seed sector involvement in plant breeding and guiding seed production. This should include the revision of legislation related to variety release and notification, quality control and seed certification, and the establishment of Plant Breeders' Rights. Unless there is a variety protection law put in place and observed by the government, it is unlikely for private companies to become involved in variety development;

(ii) provide private seed producers with access to the lines and varieties developed by the NARS, including access to breeder and/or foundation seed;

(iii) facilitate the importation of germplasm and certified seed when needed; and

(iv) improve the seed market by developing varieties that fit farmers' needs and strengthening extension services. This requires a good variety development program, farmer participation throughout the development process, intensive involvement of the national extension service, and effective distribution.

Enhance efforts to increase the rate of adoption by farmers of improved varieties. The formal seed supply systems in the Near East and North Africa have a mutually dependent relationship with the research sector in the variety development phase. However, until varieties that correspond with farmers' needs, are produced and on-farm improved seed production is strengthened, the research system will continue to have little relevance to the informal seed supply systems in the region. Plant breeding efforts should be integrated into farming communities that possess the knowledge and genetic material in landraces that have been used and preserved for generations. In addition, farmers' specific requirements and their reactions to newly released varieties should be integrated to the on-going selection process if on-farm testing is part of the program.

Ensure balanced variety development and seed production of major commodity crops. There is a need to enhance national capabilities in plant breeding and seed production and supply for a number of major groups of crops, which are currently underdeveloped in almost all countries of the Near East and North Africa. These include certain cereal crops, most of vegetable crops, food legumes and pasture and forage species. I addition, greater attention needs to be given to crops used by small farmers and those adapted to harsher environments. The number of scientists and technicians working on these crops is presently very small.

Maintain an efficient extension system. Extension should play a crucial role in training farmers in on-farm seed production and is therefore a prerequisite to the improvement of the informal seed systems. Extension work could focus on raising awareness among farmers regarding the merits of the improved seed being introduced and work towards improving the ability of farmers to control the quality of seeds. While the importance of extension services in the Near East and North Africa seed production is clear, maintaining an effective extension system requires significant ongoing resources. Therefore, all attempts should be made to make efficient use of extension services when it is most needed. To this end it is necessary that:

(i) countries in the region recognize the critical role of extension services in the development of the seed sector and agricultural in general;

(ii) development agencies and NGOs in agricultural extension be encouraged to participate; and

(iii) the role of research in agricultural extension, which can lead to an increase in the efficiency of extension services, be strengthened.

Enhance professional and technical capabilities. Well-planned and effectively executed training programs can considerably improve the skills and competence of technicians in different aspects of seed technology. Trained staff can then act as a vehicle for the transfer of technologies to farmers. This can be accomplished by:

(i) launching graduate and postgraduate degree course programs in seed science and technology in collaboration with local universities;

(ii) initiating national and regional training centers;

(iii) developing cost-effective local training programs;

(iv) seeking international collaboration in the development of training modules;

(v) providing domestic funds where available and seeking international financial support;

(vi) launching in-service training courses on seed technology; and

(vii) after assessing the needs and existing infrastructure in each country, provide fellowships for short- and long-term courses in developed countries.

Ensure cost-effective use of high value land. The use of appropriate cropping systems and high seed production return are key strategies in situations with limited land availability. These can be accomplished if the following approaches are adopted:

(i) produce varieties responding to most farmers' needs. This will increase the seed market if appropriate seed distribution and marketing strategies are taken;

(ii) develop price policies promoting seed production;

(iii) encourage the use of quality seed and intensification of cropping systems through extension services; and

(iv) develop policies promoting the availability of agricultural inputs including irrigation water to farmers.

Introduce measures for more efficient seed distribution by the public sector. Despite substantial effort by NGOs to supply seeds to farmers in remote areas, the poor condition of the transport infrastructure in most of the countries in the region has been a major obstacle to the distribution of seeds. Farmers and local distributors participating in seed distribution have been observed to improve the availability of seeds to farmers. However, in the majority of countries where farmers are involved in seed multiplication they are generally involved as contract farmers not as seed producer-sellers.

Easy control and low production costs have been the major advantages of centralized seed multiplication systems in the Near East and North Africa. However, due to the problem of accessibility to rural farmers, major costs have increased in seed handling and transport. It appears that by establishing seed outlets and markets in the proximity of farming communities, a decentralized system for seed multiplication would reduce these costs. Therefore, governments should develop decentralized strategies for seed multiplication and storage. Decentralized seed production systems can also play a major role in producing seeds of improved varieties, which require less intensive management.

Another reason that storage has been established in centralized facilities is because sophisticated equipment and highly trained staff are readily available. Efforts should be made to provide appropriate equipment and technical assistance at a decentralized level, thus improving seed availability to farmers.

Develop strategies for the conservation of plant genetic resources. Nearly all countries recognized in their WANA Country Reports that plant genetic erosion is a serious problem in the Near East and North Africa. According to these reports, plant genetic erosion is caused by the replacement of local varieties by genetically uniform high-yielding varieties, population pressure, overgrazing, and environmental degradation. The loss of traditional varieties, which have diverse characteristics, is reducing the gene pool available to breeders. Therefore, governments must institute strategies that ensure the conservation of plant genetic resources. However, it should also be recognized that the conservation of germplasm by itself is of no value if it is not used to develop new products and varieties, which will increase the yield of crops. As elaborated in FAO Global Plan of Action (FAO, 1996), governments should focus on:

(i) in-situ conservation and development, which include surveying and inventorying plant genetic resources for food and agriculture, supporting on-farm management and improvement of plant genetic resources, assisting farmers in disaster situations to restore agricultural systems, and promoting in-situ conservation of wild crop relatives and wild plants for food production;

(ii) ex-situ conservation including sustaining existing ex-situ collections;

(iii) the use of plant genetic resources to promote sustainable agriculture and to develop new markets for local varieties and diverse plant products; and

(iv) promoting networks for plant genetic resources, developing early warning systems to monitor the loss of plant genetic resources for food and agriculture, expanding and improving education and training, and raising public awareness on the value of plant genetic resources.

Take measures to institute seed strategic reserves. In most of the countries in the region, there is no storage of strategic reserves for use in emergency situations. In some countries, the storage of seed reserves is carried out in central locations by parastatal seed agencies, but only for wheat and barley and for a small percentage of the total seed requirements of farmers. Infrastructure for the storage of seed security stocks at a centralized and decentralized level should be established. This can help to avoid the disruption of agricultural production and loss of local genetic material due to natural and man-made calamities.

Strengthen linkages between research, extension, and seed production. Most seed programs and donor interventions in the Near East and North Africa have been concentrated in promoting seed production. However, the long-term effectiveness of seed programs depends, to a large extent, on the coordination of the various sectors involved including research, extension, seed production, the infrastructure systems, as well as farmers' participation. These factors should be treated as sub-systems in a holistic approach to technology generation and transfer in agriculture. Therefore, more attention should be paid at the planning stage to ensure the cohesiveness of these various components. External assistance should be designed t strengthen and compliment seed production activities.

Explore opportunities for inter-country collaboration at both the regional and sub-regional levels. Opportunity may include the development of databases and common registries of farmers' varieties and improved cultivars; harmonization of seed regulatory measures; and joint ventures in seed development and production, particularly of vegetable and forage crops. Other collaborative efforts may include the formulation of regional seed associations, possibly with sub-regional chapters and the establishment of a Regional Seed Council/Board or similar executive or consultative bodies to oversee and promote such regional endeavors.

Participate actively in international seed related organizations. For countries wishing to be actively involved in global seed trade, it is important for them to establish ties with international seed organizations such as ISTA, FIS, UPOV and OECD working respectively on seed quality testing, seed trade, variety protection and seed certification.

6. CONCLUSION

National seed supply sectors of the Near East and North Africa are at various levels of development. Despite efforts by governments in the region, with assistance from private and international institutions, the seed supply sectors are currently far from meeting the seed needs of farmers. In order to address the constraints affecting the development of the national and regional seed supply that are presented in this document requires integrated efforts by all national and international stakeholders and institutions involved in seed supply and plant genetic resource management. This also requires that appropriate policies are established at all levels to facilitate seed investments in the region.

In the Near East and North Africa, various regional seed and plant genetic resource networks have been established and are currently functioning in the region. These networks are playing an important role in the development of the seed and plant genetic resource sectors. However, based on the analysis presented in this document, a mechanism or an advisory body appears essential to link national, regional, and global efforts and to guide investments for the sustainable development of the seed sectors.

7. REFERENCES

Balikcioglu, T.T. 1996. The Turkish Seed Industry. ICARDA, Focus on Seed Programs. Ankara, Turkey.

Bonte-Friendheim, C., S. Tabor, and J. Roseboom. 1994. Financing national agricultural research: the challenge ahead. ISNAR Briefing Paper No.11. The Hague, the Netherlands, International Service for National Agricultural Research (ISNAR).

Cromwell, E., E. Friis-Hansen, and M. Turner. 1992. The seed sector in developing countries: A framework for performance analysis. ODI Working Paper 65, London.

Cromwell, E., S. Wiggins, and S. Wentzel. 1993. Sowing beyond the State: NGOs and seed supply in developing countries, ODI: London, pp.142.

Cromwell, E., and B. Zambezi. 1990. The performance of the seed sector in Malawi: farmer survey preliminary analysis. Report of the Rockefeller Foundation, Lilongwe, Malawi.

ECA (United Nations Economic Commission for Africa). 1989. Review of food and agriculture in the least developed countries in the 1990s. ECA, Addis Ababa, Ethiopia.

El-Wanis, M.S.A. 1995. The Seed Industry in Egypt. ICARDA, Focus on Seed Programs. Giza, Egypt.

FAO, 1997. Report of the World Food Summit. 13-17 November, 1996. FAO, Rome, Italy

FAO, 1996a. Global Plan of Action. FAO, Rome, Italy.

FAO, 1996b. The state of the World of plant genetic resources for food and agriculture. FAO, Rome, Italy.

FAO, 1996c. World Food Summit, Technical Background Document. Vol. 2. FAO, Rome, Italy.

FAO, 1996d. World List of Seed Sources. FAO, Rome, Italy.

FAO, 1995a. The State of Food and Agriculture. FAO, Rome, Italy.

FAO, 1995b. FAO yearbook. Production. vol. 48. FAO, Rome, Italy.

FAO, 1994a. FAO Seed Review 1989-1990. FAO, Rome, Italy.

FAO, 1994b. Twenty-second FAO Regional Conference for the Near East. Report, Amman, Jordan. 3-6 July. FAO, Rome, Italy.

FAO, 1990. Production yearbook, 1990. vol. 44. FAO, Rome, Italy.

FAO, 1987. Evaluation of the Seed Improvement and Development Programme. Rapport of the 24th Session. Rome, Italy.

Heisey, P. 1990. Accelerating the transfer of wheat breeding gains to farmers: a study of the dynamics of variety replacement in Pakistan, CIMMYT Research Report. No. 1, Mexico, D.F. CIMMYT.

Hussein, K.M. 1996. The Yemen Seed Industry. ICARDA, Focus on Seed Programs. Dhamar, Yemen.

ICARDA, 1993a. Medium-term Plan (1994-1998). pp.121. Aleppo, Syria

ICARDA, 1993b. Annual Report. Aleppo, Syria.

ICARDA and GTZ, 1997. Privatization of the seed industry in the West Asia and North Africa. Proceedings of Workshop on Privatization of the seed Industry in the WANA Region. Tunis, Tunisia (16 to 20 November, 1995).

Jaffee, S. and J. Srivastava. 1992. Seed System development: The Appropriate Roles of the Private and Public Sector. World Bank discussion Papers no. 167.

Kelly, A. F., 1989. Seed Planning and Policy for Agricultural Production. Belhaven Press (a division of Pinter Publishers). UK.

Le Buanec, B. 1997. Seed trade in West Asia and North Africa, the European union and other countries. In A.J.G. van Gastel et al. (ed.) Privatization of the seed industry in the West Asia and North Africa region. GTZ, Eschborn, Germany.

Madaratti, A, and I Sayed 1995. The Syrian Seed Industry. ICARDA, Focus on Seed Programs. Aleppo, Syria.

Rafiq, M. 1982. Crop production management in the agro-ecological regions of the Near East and North Africa. FAO, Rome, Italy.

Sgaier, K. 1993. Situation of seed in the Near East region. Expert Consultation on the Review of Status of Seed Technology in the Near East. Tunis, Tunisia, 30 March to 01 April 1993.

Srivastava, J.P. 1986. Status of seed production in the ICARDA region. In J.P. Srivastava and L.T. Simarski (ed.) Seed production Technology. pp. 1-14. ICARDA, Aleppo, Syria.

Tourkmani, M. 1994. Seed production and seed quality control in Morocco. Focus on Seed Programs. Rabat Morocco.

Tunwar, N.S. Emergency seed supply in Afghanistan with emphasis on policy and legal issues, activities and constraints. Project Report.

Tripp, R. and N. Louwaars. 1997. Seed regulation: choices on the road to reform. Food Policy, Vol. 22, No. 5, pp. 433-446, 1997.

Umali, D., and L. Schwartz. 1994. Public and private agricultural extension: Beyond traditional frontiers. World Bank. Discussion paper No. 236. Washington, DC.

World Bank, 1997. Workshop on organizing an African seed association. World Bank Report, Washington, D.C.

Zentani, A. 1995. The Libyan Seed Program. ICARDA, Focus on Seed Program, Tripoli, Libya.

ANNEX

SUMMARY DATA OF THE SEED SECTORS IN THE NEAR EAST AND NORTH AFRICA

In the following pages the countries have been grouped as follows: Algeria, Egypt, Libya Morocco, Tunisia, Afghanistan, Cyprus, Iran, Iraq, Jordan, Lebanon, Pakistan, Sudan, Syria, Turkey, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, and Yemen

For each country, when available, data are reported with respect to: the land, development of the seed sector, institutions involved in the application of plant biotechnology and plant genetic resources preservation. Data on the seed sectors countries have been obtained mainly from the FAO Seed Review 1989-90, FAO yearbook Production, WANA Country Reports. Data on biotechnology from data available at FAO, World Bank, GTZ, ICARDA. Data on germplasm collections from the FAO State of the World's Plant Genetic Resources and Directories of Germplasm collection, IPGRI.

ALGERIA

The land

South of the fertile lands on the Mediterranean coast lie the Tellian and Saharan Atlas mountain ranges, with a plateau extending between them. Further south is the Sahara desert, rich in oil, natural gas and iron deposits. Different altitudes and climates in the north make for agricultural diversity, with Mediterranean-type crops (vines, citrus fruits, olives etc.) predominating.

Land use: arable 3%, forest 2%, pasture 13% other 82%
Active Population employed in agriculture: 31.1%
Agricultural production index: 100 (1979-81), 95 (1990)
Food production per capita: 100 (1979-81), 94 (1990)
Food import dependency: 71%

Seed sector

Plant breeding: Plant breeding research is performed at IDGC (Institut de Développement des Grandes Cultures) on cereals, grain legumes and fodder plants. Improved varieties are tested by the IDGC, but there is no Seed Release Committee or Registration Service.
Seed production is performed at the IDGC stations, pilot farms and by independent growers.

Seed quality control: Seed quality control is performed for cereal and legume seeds by IDGC and by the Organisation Algérienne Interprofessionnelle des Céréales (OAIC).

Seed marketing and distribution: Controlled cereal and pulse seed is marketed by OAIC, while fodder and vegetable seed is marketed by ONAPSA.

Application of plant biotechnology

At the National Institute for Agricultural Research breeding programs are carried out on anther culture of durum and soft wheat and barley and on somatic embryogenesis in artichoke. At the Institute for the Development of Vegetable Crops, biotechnology focuses on in-vitro propagation of potato. At the National Agricultural Institute (INA, El Harrach, Algiers) tissue culture of potato, wheat and barley have been developed together with studies on nitrogen fixation and assimilation by chickpea and on the isolation of highly effective Rhizobium strains. At the "Houari Boumedienne" University of Science, research in molecular genetics (on Bacillus thuringensis and on yeast mitochondrial DNA) are performed in the laboratory of Microbiology. At the National Agricultural Institute, biological nitrogen fixation in beans, broad beans, lentils and chickpea are being studied.

Plant genetic resources

The following Institutions are involved in germplasm collection: Institut de Développement des Grandes Cultures (IDGC) in El Harrach, dealing with: *Hordeum vulgare, Sorghum bicolor, Aegilops spp., Triticum spp.*

EGYPT

The land

99% of the population live in the Nile valley and delta although this constitutes only 30% of the land. The remaining land is covered by deserts except for a few isolated oases. The floods of the Nile set a pattern for the country's economic life thousands of years ago. There are several dams, the major one being the Aswan dam in the south. This has enabled farmers to add new crops such as cotton and sugar cane to the traditional cops; wheat, rice and corn.

Land use: arable 3%, forest 0%, pasture 0% other 97%
Population employed in agriculture: 38.6%
Agricultural production index: 100 (1979-81), 114 (1990)
Food production per capita: 100 (1979-81), 123(1990)
Food import dependency: 45%

Seed sector

Plant breeding. Plant breeding is carried out mainly by the Agricultural Research Center (ARC)b with additional limited contributions from the Food and Agriculture Council of the Academy of Scientific Research and technology, the Faculties of Agriculture of the numerous universities and more recently the private sector.

Variety release. Variety release is the responsibility of the Agricultural Research Center (ARC) and the Central Administration for Seed (CAS).

Seed production. The major seed producing organizations are:

Public: Agricultural Research Center: cereals, grain legumes and vegetables. Central Administration for Seed: cereals, legumes, groundnut, and cotton. Egyptian Agricultural Authority: vegetable and clover. Nobaria Seed Company: vegetables.

Private: Egyptian Agricultural Seed Co. (Giza): maize, sorghum; National Seed Company (Giza): maize and sorghum; Pioneer Seed Company (Cairo): maize and sorghum.

Seed quality control: At present the law No. 53 of 1966 is cooperative and regulates production and distribution of all field and vegetable crops. The Central Administration for Seed is in charge of seed law enforcement. Three testing laboratory of CAS, at Giza, Tanta and Minia perform laboratory analysis in accordance with ISTA Rules.

Seed marketing and distribution: the Credit Bank in Cairo markets Most of the cereal seeds through co-operatives. Part of the vegetable seeds are imported and marketed by private merchants.

Extension. Extension and promotion are tasks of the Ministry of Agriculture

Application of plant biotechnology

Plant biotechnology research is carried out in the Cell Research Section of the Agriculture Research Center (ARC) in Giza, which is the Biotechnology Center in the Ministry of Agriculture. The main objective of the Cell Research Section is to transfer agronomically desirable traits, such as tolerance to salt, drought and pests, between species or genera, utilizing the embryo rescue and tissue culture techniques. In spite of equipment and chemical supply limitations, some progress has been made. Callus initiation and generation ere started in commercial varieties of wheat, barley, maize, sorghum, rice, alfalfa and faba beans. Micropropagation was initiated in alfalfa and faba beans to produce mutants that are difficult to obtain somatically or sexually. Future research plans include the use of protoplast fusion for interspecific or intergeneric crosses that are impossible to achieve by conventional breeding methods, and work on drought and salinity resistance for wheat, rice and alfalfa, using callus, cell suspension and protoplast culture.

Research activities at the Department of Genetics, Cairo University, include cloning of the *Bacillus thuringiensis* endotoxin gene. Other research projects include cloning o nitrogen-fixation genes and protein engineering of soybean and faba beans. Research of the Department of Horticulture at Zagazig University includes tissue culture techniques for the micropropagation of ornamentals, such as carnation and gladiolus. Future plans include the propagation of woody trees by tissue cultures and the development of virus-free, salt and drought tolerant plants. The Botany Department at Zagazig University is conducting research on cytogenetic in wheat, determining some important traits and protein fraction in wheat varieties by electrophoresis techniques. Planned projects include the induction of haploid plants in wheat and barley from culturing anthers and pollen grain.

At Assiut University research by the Horticulture Department includes utilization of tissue culture techniques for hardening vegetable crops; and selection of salt and/or drought tolerance in the callus culture in garlic, followed by regeneration of the plantlets. At Assiut University, the Department of Genetics focuses mainly on Genetic systems governing the variability in a number of plant attributes that contribute to success under dry conditions. Another tissue culture laboratory for mass propagation of plants has been established at the Faculty of Agriculture in Al-Azhar University and deals with differentiation problems of maize and wheat. Tissue culture laboratories have also been established at the Desert Institute, Ain Shams University, and Al-Swiss University. The Egyptian Academy of Science and Technology signed an agreement with the United Nations Development Programme (UNDP) and United Nations Industrial Development Organization (UNIDO) for establishing a laboratory affiliated with the International Center for Genetic Engineering and Biotechnology based at Trieste. In 1985 a Division of Genetic Engineering and Biotechnology was established at the National Research Center comprising six departments among which: molecular biology, microbial genetics, cell biology and plant tissue culture.

Plant genetic resources

There are some financial and technical but no legal restrictions access to samples of genetic resources. The responsible organization is: Field Crops Research Institute, Agricultural Research Center (ARC) Giza, dealing mainly with maize, but also with wheat, rice, barley, lentils, soybean, cotton, onion, clover.

LIBYAN ARAB JAMAHIRYA

The land

Most of the country is covered by desert: The only fertile lands are located along the temperate Mediterranean coast, where most of the population lives. There are no perennial rivers and rain is scarce. The country has major oil reserves.

Population employed in agriculture: 12.6%
Agricultural production index: 100 (1979-81), 102 (1990)
Food production per capita: 100 (1979-81), 102(1990)
Food import dependency: 73%

Seed sector

Plant breeding: The main plant breeding institution is the Agricultural Research Center (ARC) with headquarters in Tripoli and a number of well distributed Regional Centers situated in the major agricultural areas. The major plant breeding activities are mainly for wheat and barley and some legume and vegetables crops.

Variety release: Variety release is the joint responsibility of the Ministry of Agriculture and the Agricultural Research Center (ARC).

Seed production: A number of organizations were in the past responsible for seed production including para-statal companies. Following a recent major reform of the seed sector, the prime responsibility for seed production has been vested on a newly established organization, namely: the National Center for Production and Propagation of Improved Seeds (NCPPIS). The production and propagation activities are carried out in the Center's facilities as well by contracts with farmers.

Seed quality control: This will be the responsibility of NCPPIS in collaboration with the Ministry of Agriculture and the IRC.

Seed processing: This will be the responsibility of NCPPIS.

Seed storage: This will be the responsibility of NCPPIS.

Seed marketing and distribution: This is the responsibility of NCPPIS with some activities carried out by private sector particularly in marketing vegetable seeds.

Extension: Extension and promotion is the responsibility of the Ministry of Agriculture with increased involvement of the newly established NCPPIS.

Application of plant biotechnology.

A tissue culture laboratory was established in 1985 in the Regional Agricultural Research Center in the Fazan District. This laboratory is involved mainly in date propagation to obtain drought- and disease-resistant varieties. Explants have been produced and prepared for transfer to soil.

Plant genetic resources

Plant genetic resources collection and conservation activities go back to 1972 when collection expeditions were formed in collaboration with the then IBPGR and FAO. Accessions are kept in Regional Genebanks such the one in Bari, Italy. Plans are underway for constructing a Genebank in the Agricultural Research Center (ARC).

MOROCCO

The land

The country has a long, 800-km coastline influenced by the ocean. In the eastern part there are two mountain ranges (Atlas e Rif) covered with a barren steppe and inhabited by nomadic Berbers. In the foothhills lie irrigated plains where citrus fruit, vegetables and grain are cultivated. On the western slopes of the Atlas Mountains (grand Atlas and Anti-Atlas), cattle are raised and there are phosphate, zinc and lead mines. Along the coastal plains grapes and citrus fruit are grown.

In Morocco more than 57% of the population lives in rural areas where 68% of the population derives their income from agriculture. Drought affect more than 60% of the arable land and an increasing acreage is affected by salinization, mainly in the coastal and semi-arid zones, as well as in the oases.

Population employed in agriculture: 33.1%
Agricultural production index: 100 (1979-81), 125 (1990)
Food production per capita: 100 (1979-81), 124 (1990)
Food import dependency: 28%

Seed sector

Variety release: New varieties are registered by decree of the Ministry of Agriculture and Agrarian Reform on the proposal of the National Committee for Seed and Planting Materials Selection. Before release, the new varieties are tested in field for D.U.S. (Distinctness, Uniformity and Stability) and V.C.U. (Value for Cultivation and Use). Monitoring of the trials is assured by multi-disciplinary technical units in the various departments of the Ministry of Agriculture.

The official Institution in charge of variety release and registration in the Official Catalog is Direction de la Protection des Végétaux, des Contrôle des Semences et des Plants (DPVTRF/scsp) in Rabat.

Seed quality control. The Institution in charge of seed quality control is: Service du Contrôle des Semences et des Plants in Rabat. Production, monitoring and marketing of seeds and planting materials are organized by Dahir (decree) N° 1.76.472 of 19 September 1977. The Seed and Planting Materials Monitoring Service is responsible for enforcing and updating regulations regarding production, control and certification of seeds and planting materials. Laboratory checks on seed quality are conforming to ISTA rules. Technical regulations governing control and certification are in accordance with OECD rules.

Seed processing. Seed processing is performed by the SONACOS (Société Nationale de Commercialisation des Semences) in its 13 processing centers. The main packaging material used is the 100-kg bag for cereals, 25 kg for maize and 50 kg or potatoes.

Seed storage. Seeds are stored at the processing plant points and at the 340 sales points and 13 SONACOS centers.

Seed marketing and distribution. Marketing and distribution are carried out by SONACOS.

Extension. Extension is carried out by SONACOS

Application of plant biotechnology

Several tissue culture laboratories have been established during the past 15 years. Among the most important are the following: Institut Agronomique et Vétérinaire Hassan II, Rabat, which includes the tissue culture laboratory in Agadir. Main activities are clonal mass propagation, recovery of pathogen-free plants, variety improvement using haploid plants, somatic embryogenesis and callus and cell suspension cultures for selecting stress tolerant genotypes. Other research activities concern drought tolerance in barley, *Hordeum vulgare*, using conventional and tissue culture techniques, including crosses between different genotypes, screening in vitro for drought tolerance, creation of haploid by crossing cultivars with H. *bulbosum*, and haploid embryo rescue.

Faculty of Science at Mohammed V University in Rabat. Is concerned mainly with cereal and vegetable crop improvement through plant biotechnology techniques. Wheat plants are being produced through pollen, anther culture and somatic embryogenesis. Training courses in tissue culture are conducted at various research laboratories in Morocco in collaboration with regional and international organizations such as the Arab Union for Scientific Research Council, the Tissue Culture for Crops Project (TCCP), the United States Agency for International Development (USAID) and the FAO. Collaboration between Morocco, Algeria, Tunisia has resulted in a joint research effort concerned with propagating the date palm by in vitro techniques.

Plant genetic resources

The following Institutions are involved in germplasm collection: Station Centrale des Plantes Fourragères, Institut National de la Recherche Agronomique (INRA), in Rabat, dealing with: *Arachis hypogaea, Cajanus cajan, Cicer arietinum, Lens culinaris, Vicia faba, Phaseolus vulgaris, Pisum sativum, Vigna unguicolata*, Sorghum and Millet Section, Institut National de la Recherche Agronomique (INRA), Guich, Rabat, dealing with: *Zea mays*.

SUDAN

The land:

Irrigated agriculture dominates the northern region of the Sudan and mainly confined to lands close to the River Nile and its tributaries. The Northern region is sparsely populated and intensively cultivated with wheat, date palm, citrus, mangoes and legumes.

The central clay plains are densely populated. Farming systems include mechanized rainfed, traditional rainfed and irrigated agriculture. Crops include sorghum, sesame, groundnuts, vegetables and fruits.

The western region is dominated by sandy soils and is sparsely populated. Crops include sesame, millet, groundnuts, sorghum, watermelon seeds and livestock raising.

The Southern region is sparsely populated. Crops include tea, coffee, cocoa some fruits and livestock raising.

Land Use: The main farming systems include pastures (32.5%), forests (53.3%), mechanized rainfed (5%) traditional rainfed (7.5%) and irrigated (1.7%).
Population employed in agriculture 70%.
Agricultural Production Index: 100 (1970/80-1981/82), 113 (1995/96)
Food Production per capita: 100 (1979/80-1981/82), 73 (1995/96)
Food Import Dependency: 26%

Seed sector:

Plant breeding: The plant breeding program for release of improved varieties is an old research program spread over the experimental stations of the Agricultural Research Corporation (ARC). Crops include wheat, groundnuts, sorghum, cotton and vegetables. The faculties of Agriculture of the University of Khartoum (crops include field crops and vegetables) and the University of Gezira (field and vegetable crops) also participate in this program.

Variety release: Variety releases involve several steps starting with the breeder, the variety release committee, etc. The variety releases require that an official catalogue be kept by the Seed Administration of the Ministry of Agriculture and Forestry (SAMAF). The variety release committee (membership of which is determined by the Minister of Agriculture) comes under the seed council and is headed by the Director of ARC. The breeder requesting the release of the new variety prepares a technical report. The variety must be superior to the currently produced varieties in at least one attribute and distinguishable from similar varieties.

Seed production: Seed production has already been privatized. Organizations involved in seed production are private companies (7), business names and individuals (13) and governmental schemes (5).

Seed quality control: Seed quality control is the responsibility of the SAMAF. Seed testing is carried out in three laboratories at Sennar, Hudieba and Gezira. Seeds are certified in accordance with the seed ACT (1990) and testing is done according to ISTA rules.

Seed processing: Sixteen seed processing plants are available in Sudan (for all crops).

Seed marketing and distribution: About twenty-four private companies, business names and individuals deal with seed importation, distribution and marketing.

Extension: The national extension program is the responsibility of the Central Extension Administration of the Ministry of Agriculture and Forestry (head office in Khartoum).
Extension Administrations are available in almost all states and are administratively part of the State governments.

Application of plant biotechnology:

Four tissue culture laboratories are available. Two laboratories belong to the ARC (one in Wad Medani in the Central region and the other in Merawi in the northern region). One laboratory belongs to the Islamic Development Company in Khartoum and the fourth belongs to the Gezira University in the Central Region.

Plant genetic resources:

There is a gene bank in ARC for the collection, preservation, description and distribution of the genetic resources.

TUNISIA

The land

The eastern coastal plains are heavily populated and intensively cultivated: olives, citrus fruit and vineyards. The interior is dominated by the mountainous Tell and Aures regions populated by nomadic shepherds. The Sahara desert, in the south, gas phosphate and iron deposits, while dates are cultivated in the oases.

Land use: arable 30 %, forest 4 %, pasture 19 % other 47 %

Population employed in agriculture: 20,6
Agricultural production index: 100 (1979-81), 102(1990) Food production per capital: 100 (1997-81), 96 (1990)
Food import dependency: 59 %

Seed sector

Plant breeding: The development of new varieties is performed at: INRAT in Ariana, Institut National Agronomique de Tunis in Tunis, Ecole Supérieure d'Horticulture in Chott-Mariem, Ecole Supérieure d'Agriculture du Kef in le Kef and Institut de l'Olivier in Sfax.

Variety release. The Institut National de la Recherche Agronomique de Tunis, as considered by the law 76-113 of 25 November 1976, keeps an official catalogue. The registration and acceptance of a new variety is registered by the Director of INRAT and on the advice of the Comité National Consultatif de Semences et Plant after D.U.S. (Distinctness, Uniformity and Stability) and VCU (Value for Cultivation and Use) trials.

Seed production. The organizations involved in seed production are: CCSPS, COSEM, and GIL which deal with wheat, barley. triticale, vegetables and potatoes.

Seed quality control. The organizations responsible for seed quality are: Laboratoire de Contrôle et de Certification des Semences et Plants in Tunis, Laboratoire de Contrôle des Semences, le Krib Siliana. Seeds are tested in laboratories in accordance to ISTA rules.

Seed processing, There are three private seed treatment plants in the country: COSEM (cereals) CCSPS (cereals, legumes, forage and vegetables) GRAFOUPAST (forage).

Seed marketing and distribution. Many organizations (about 48) import seeds. The main methods of transport used for seed marketing and distribution are trucks and trains. Jute bags, kraft paper and metal boxes are the principal packaging materials used.

Extension. Extension is limited to field days organized by: Agence de la Vulgarisation et la Formation Agricole, Centre Technique des Céréales, and Centre Technique de la pomme de terre.

During the field days the participants are asked to attend lectures, information sessions and to visit demonstration plots.

Application of plant biotechnolgy

Active research into plant tissue culture for date-palm propagation is being conducted at the University of Tunis and at the Biotechnology Center in the National Institute for Scientific Research and Technology. Micropropagation of virus-free potato, vinegrapes strawberries and citrus is being conducted at the National Institute for Agricultural Research.

Tissue culture techniques are used in cereal breeding at the Laboratoire de Génétique et d'Amélioration des plants de l'INAT to select for drought tolerance, Disease resistance and protein quality. (Calli induced from immature embryos and Double haploids are being used).

Plant genetic resources

The following Institutions are involved in germplasm collection: Laboratoire de Genétique, Institut National Agronomique de Tunisie (INAT), Ministère de l'Agriculture, Belvédère, Tunis, dealing with: *Hordum vulgare, Pennisetum glaucum, Triticum spp.* Institut National de la Recherche Agronomique de Tunisie (INRAT), Ariana, dealing with: *Capsicum annuum, Hordeum vulgare, Triticum sp.*

AFGHANISTAN

The land

The country consists of a system of highland plains and plateaus, separated by east-west mountain ranges, which converge, on the Himalayan Pamir. The main cities are located in the eastern valleys. The country is dry and rocky though there are many fertile lowlands and valleys where cotton, fruit and grain grown.

Land use: arable 12%, forest 3%, pasture 46% other 39%
Population employed in agriculture: 52.1%
Agricultural production index: 100 (1979-81), 95 (1987)
Land use: arable 0%, forest 0%, pasture 8% other 92%
Population employed in agriculture: 2,5%

Seed sector

Plant breeding. Plant breeding is carried out at the Agricultural Research Institute of Afghanistan (ARIA) of the Ministry of Agriculture in Kabul. This institute works with wheat, cotton, chickpea, sunflower, rice, maize, forage crops, vegetables and fruit crops. Most of the varieties recommended for cultivation have been selected abroad or at ICARDA.

Variety release. Cultivars, including introductions, are tested in multilocational yield trials. They are released after superior performance has been identified. The Official Release Committee consists of the President of ARIA, breeders and representatives from the Seed Agency and Agricultural Extension. ARIA is responsible for variety registration.

Seed quality control. There is no seed legislation or seed law in force. The Certification Unit of the Agricultural Extension Department, in Kabul, is the Seed Certification Agency. Laboratory tests are performed according to ISTA rules. The Seed testing of wheat, cotton, maize, alfalfa, potato and vegetable crops is done by the Seed Quality Control Institution: Improved Seed Enterprise (ISE), in its four testing laboratories. The ISE purchases the seed from government research farms and contract seed growers if the seed lots meet the minimum standards.

Seed production. ISE produces seed of wheat, cotton, maize, forage crops, potato, oilseed crops, vegetables and fruit planting materials at its own farms. The other major seed producing organization is the Agriculture Research Institute in Kabul.

Seed processing. The main processing plant in the public sector is the ISE, Badam Bagh seed Processing Plant in Kabul. The main processing plant for foundation whet seed is ISE, Dural Aman Wheat Seed Processing Plant in Kabul.

Seed storage. Seed storage is mainly performed by the public sector in 11 stores. On-farm storage of potato, garlic and other root crops, using earth built storehouses is carried out.

Seed marketing and distribution. Seeds are mostly sold through the Finance and Store Section of ISE. The most common seed packages are jute bags (50-kg capacity) for wheat and plastic bags (100 to 500 g capacity) for vegetables. Credit supply is through the Agriculture Bank.

Extension. There are no policy measures to affect foreign trade in seeds. Seed is promoted by ISE, Agricultural Extension Department and ARIA through radio and television bulletins and demonstrations of new improved varieties on farmers' fields and research stations.

Plant genetic resources

The following Institutions are involved in germplasm collection: Crop Germplasm Unit, Crop Improvement Division, Plant Research and Soil Science Department, Darul Aman Agriculture Research Station, Ministry of Agriculture, Kabul, dealing with: Cicer arietinum, Vicia faba, Vicia sp., Phaseolus vulgaris, Pisum sativum, Vigna radiata. Plant Genetic Resources Unit, Ministry of Agriculture and Land Reform, Darul Aman Research Station, Kabul, dealing with: Hordeum vulgare, Oryza sativa, Triticum spp.,
Zea mays, Brassica juncea.

CYPRUS

The land

Once a part of continental Europe, the highland of Cyprus is located in the eastern Mediterranean, close to Turkey. Two mountain ranges - the Troodos in the southwestern region, and the Kyrenia in northern Cyprus - enclose a fertile central plain. The temperate Mediterranean climate, with hot and dry summers and mild rainy winters, is good for agriculture.

Land use: arable 17%, forest 13%, pasture 1% other 69%
Population employed in agriculture: 18.8%
Agricultural production index: 100 (1979-81), 103 (1990)
Food production per capita: 100 (1979-81), 103(1990)

Seed sector

Plant breeding. The Institution in charge of plant breeding is the Agricultural Research Institute (ARI), in Nicosia, dealing with cereals, grain legumes, vegetables, potato. There are no laws or regulations regarding Plant Breeding Rights.

Variety release. The present seed law does not include any regulation for variety registration. However within the Department of Agriculture there is a Seed Committee, which decides on the release of a new variety, selected by the ARI. A new seed law has been drafted which includes administrative and technical procedures for the registration of new varieties. This draft law is expected to be passed in the near future. At present there is no agency for variety registration.

Seed quality control. The Department of Agriculture administers the seed law, in force since 1947 and updated in 1954. Seed certification schemes are currently in operation for cereals, forage crops and vegetables, but are not regulated by seed laws. These schemes follow the normal procedures, with inspection of the seed crops, control plots and seed testing. The Seed Certification Agency is the Agronomy Section (Seed Testing Laboratory) of the Department of Agriculture, which is a member of ISTA since 1976

Seed processing. Seed processing is carried out by the following organizations: Seed Production Center, Department of Agriculture, Nicosia; Co-operative Carob Marketing Federation Paphos Ltd, Paphos; P. Samaras Import-Export Ltd., Nicosia; Frixos Constantinou and Son Ltd., Paphos; Andreas I Kostekoglou, Nicosia.

Seed marketing and distribution: The organization involved in seed marketing control is the Department of Agriculture in Nicosia. Seed Marketing Organizations include the following: Seed Production Center, Department of Agriculture, Nicosia; Co-operative Carob Marketing Federation Paphos Ltd., Paphos; P. Samaras Import-Export Ltd., Nicosia; N.K. Shacolas Ltd., Nicosia; Spyros Stavrinides Chemicals Ltd., Nicosia; Central Co-operative Bank, Nicosia; Demetres Soukiouroglou

Ltd., Nicosia; Lambrou and Zorlakis, Nicosia; Petros G. Mavrikios, Limassol; Seed packaging material used are jute bags (cereals) and polypropylene bags. Transportation of seeds during marketing and distribution is by trucks and cars.

Extension. Extension is performed by the public sector (Department of Agriculture) as well as by the private sector and includes organization of field days, establishment of demonstration plots, radio and TV programs, and advisory leaflets.

Plant genetic resources

The following Institutions are involved in germplasm collection: Agricultural Research Institute (ARI) Athalassa, Nicosia, dealing with: Cicer arietinum, Lens culinaris, Vicia fabe, Vicia spp., Hordeum vulgare, Aegilops spp., Triticum durum.

ISLAMIC REPUBLIC OF IRAN

The land

Central Iran is a steppe-like plateau with hostile climate, surrounded by desert and mountains (the Zagros on the western border and the Elburz to the north). Underground water irrigates the oasis where many varieties of grain and fruit trees are cultivated. The shores of the Caspian Sea are more humid and suited to tropical and sub-tropical cops (cotton, sugar cane and rice).

Land use: arable 11.2%, forest 8.1%, pasture 54% other 26.7%
Population employed in agriculture: 23.5%
Agricultural production index: 100 (1979-81), 97 (1990)
Food production per capita: 100 (1979-81), 97(1990)

Seed sector

Plant breeding. The major organization responsible for plant breeding is: Seed and Plant Improvement Institute (SPII) in Karaj

Variety release. The responsibility for variety evaluation, registration and introduction lies with the Seed and Plant Improvement Institute. There is an Official Release Committee composed of heads of research institutes.

Seed production. Seed research is carried out at the Seed and Plant improvement Institute in Karaj. This institute is the main public seed producing organization.

Seed quality control. There is a seed law in preparation, but no seed law currently in force. The responsible organization is the Seed Production and Control Division, Seed and Plant Improvement Institute in Karaj. ISTA rules are followed for seed testing; IRAN has been affiliated to ISTA since 1974.

Seed marketing and distribution. The main public marketing agency is the Agricultural Support Services Company in Teheran

Plant genetic resources

The Institutions involved in germplasm collection include: Plant Genetic Resource Division, Seed and Plant Improvement Institute (SPII), Agricultural Research, Education and Extension Organization, Ministry of Agriculture in Karadj dealing *with Pisum spp, Lens spp, Cicer spp, Medicago spp,* *Trifolium spp, Vicia spp, Lotus spp, Aegilops spp, Aegilops spp, Triticum spp, Agropyron spp, Secale spp, Avena spp, Sorghum spp, Daucus spp, Solanum spp, Allium spp, Brassica spp, Pistacia spp, Amygdalus, Amygdalus spp, Pyrus spp, Prunus spp, Vitis spp, Ficus spp, Cucumis spp, Juglans regia*

IRAQ

The land

The Mesopotamic Region, between the rivers Tigris and Euphrates in the centre of the country, is suitable for agriculture and contains most of the population. In the mountainous areas in the north there are important oil deposits. In Lower Mesopotamia, on the Shatt-al-Arab channel, where the Tigris and the Euphrates merge, fifteen million palm trees produce 80% of the world's date.

Population employed in agriculture: 17.7%
Agricultural production index: 100 (1979-81), 91 (1990)
Food production per capita: 100 (1979-81), 92(1990)

Seed sector

Plant breeding. Agricultural research centers including SBAR, IPA, IAE, and Agricultural Universities have the responsibility to produce new varieties, test the imported varieties, maintain the parental materials of existing varieties and produce foundation seeds.

Variety release. The crop area under improved varieties is less than 1%. There are no formal arrangements on variety evaluation and registration.

Seed quality control. Regulations for seed production, testing and certification were issued by the Supreme Agricultural Council in 1974. A State Board for Seed Testing and Certification (SBSTC) was established in 1994 as the authorized organization responsible for seed quality control in the country. The seed testing and certification Centers include Abu Ghraib (Baghdad), Kut (Wassit), Mosul (Ninaveh). Seed testing is performed according to ISTA Rules.

Seed marketing and distribution. Seed industry is comprised of three companies, two of which are state owned and the third is partially owned by the state. Seed is distributed is through government stores network.

Application of plant biotechnology

In view of the importance of the date palm in Iraq, tissue culture laboratories were established in 1979 in the Agriculture and Water Resources Research Center and at the Genetic Engineering and Biotechnology Scientific Research Center, for the purpose of improving plant production. Similar laboratories were set up at Basra and Musul Universities and at the Ministry of Agriculture, the later in collaboration with FAO, for the propagation of commercial crop species such as potatoes and fruit trees. Research at the Faculty of Agriculture and Biology in the Nuclear Research Center concerns the establishment of optimal conditions for the transfer of in vitro regenerated date palms to the soil. Date-palm propagation by tissue culture is being studied at research institutions and universities in Baghdad and Basra and lettuce has been propagated by tissue culture at the Department of Biology, Mosul University.

Plant genetic resources

Germplasm collections are responsibility of the Plant Genetic Resources Unit, Agricultural Research Center (ARC), Ministry of Agriculture and Agrarian reform, Abu-Ghraib, Baghdad, dealing with:

Copyrighted material

Cicer arietinum, Vicia faba, Vigna spp, Hordeum bulbosum, Hordeum vulgare, Hordeum spp., Oryza sativa, Sorghum bicolor, Aegilops spp., Zea mays, Brassica spp., Raphanus spp., Abelmoscus esculentus, Cucumis spp., Cucurbita spp., Lycopersicon lycopersicum, Solanum melongena, Daucus carota, Spinacia oleracea. There are no restrictions on access to samples of genetic resources.

JORDAN

The land

75% of the country is a plateau, which is part of the Arabian desert, 600 to 900 m in altitude. The western part of this plateau has a series of cleavages at the beginning of the great Rift Fault, which crosses the Red Sea and stretches into east Africa. In the past, these fissures widened the Jordan River valley and formed the steep depression, which is now the Dead Sea. The area is suitable for agriculture though the climate tough, except along the shores of the Red Sea. As most of the country is made up of dry steppes, farming is limited to cereals (wheat and rye) and citrus fruits. Sheep and goats are also bred.

Agricultural production index: 100 (1979-81), 108 (1990)
Population employed in agriculture: 4.6%
Land use: arable 4%, forest 1%, pasture 9%, other 86%.
Food production per capita: 100 (1979-81), 108 1990)
Food import dependency: 85%

Seed sector

Plant breeding. Plant breeding is performed at the Research and Extension Department, Ministry of Agriculture (Amman) for wheat, barley and tomato. Faculty of Agriculture, University of Jordan (Amman) for wheat, barley, chickpea and lentil. Faculty of Biology, Yamrmouk University (Irbid) for wheat.

Variety release. Variety release and registration for wheat, barley, chickpea, lentil and vegetables is the responsibility of the Research and Extension Department, Ministry of Agriculture.

Seed quality control. Quality control is performed by the Development Department, Field Crop Section, Ministry of Agriculture (Amman)

Seed marketing and distribution. Seed is marketed trough the Ministry of Supply, through various private companies and the Jordan Co-operative Organization.

Application of plant biotechnology

The Higher Council of Science and Technology is making plans to establish a national council for biotechnology, responsible or all research and development in this field. A Committee has been set up for food and agriculture. Plant production research is related mainly to conventional breeding and collection and evaluation of cereal genetic resources, with emphasis on collating germplasm of barley and durum wheat for possible use in breeding for environmental stress tolerance. A collaborative research program evaluating wild emmer (Triticum dicoccoides) is planned, mainly to assess genetic variability for morphological and agronomic traits in the wild emmer wheat collection in Jordan and its range of tolerance to drought stress.

Plant genetic resources

Organizations involved in germplasm collections are Research and Extension Department, Ministry of

Agriculture (Amman) for wheat and barley. Department of Forest and Ranges, Ministry of Agriculture (Amman) for grasses and legumes. Faculty of Agriculture, Department of Plant production, University of Jordan (Amman) for wheat, barley, chickpea and lentil. Faculty of Biology, Yarmouk University (Irbid) for wheat.

STATE OF KUWAIT

The land

The surface topography of Kuwait is generally from flat to gently rolling desert plain, broken by occasional low hills, scarps depressions and wadis. The land level rises from zero m at the shores of the Arabian Gulf to 300m at the southwest of the country. The soils of Kuwait are predominantly sandy of eolian and alluvial origin.

Climate: dryness and extremely high temperatures characterize the climate of Kuwait in summer and short mild winters. The average annual rainfall: The country receives a total of about 110mm, usually in winter between November and May, however occasional showers may fall in October.

Land Use: Based on the total lad area, the urban and industrial areas represent about 3.7%, Rangeland 70%, (Agriculture + Parks) 5.3% and other 20%. (Soil Survey for the State of Kuwait Project phase I, 1998) Population employed in Agriculture: 0.7% of total population
Food import dependency: about 90%

Seed sector

Plant breeding: Local plant breeding of tomato, melon, squash, pumpkins, water melon and okra is carried out by The Public Authority For Agriculture and Fish Resources (PAFF).

Variety release: There are no formal procedures for variety Release or registration testing and release of new varieties is performed by PAFF.

Seed production: No seed producing organizations are present.

Seed quality control: There are regulation of the agricultural quarantine and decision for the phytosanitary regulation for importing and manipulating seeds and seedlings.

Seed marketing and distribution: Seeds are imported and distributed through authorised establishments and companies after testing by PAFF.

Application of plant biotechnology

In Kuwait, agricultural research was pioneered by PAFF particularly concerning protected agriculture and hydroponics. Plans are underway for establishing tissue culture laboratory at the Kuwait Institute for Scientific Research. A national plan for biotechnology and genetic engineering is being prepared in collaboration with UNIDO. This includes a plant biotechnology programme to develop drought-and salt resistant plants through genetic engineering techniques and micropropagate ornament plants, legumes and date palms through tissue culture and other advanced biotechniques.

Plant genetic resources

The institution involved in germplasm collection is (PAAF), dealing with melons, pumpkins and squash.

LEBANON

The land
One of the smallest Middle East countries, Lebanon has a fertile coastal plain with a mild Mediterranean climate, making it rainy in the winter, where most of the population lives. Between two parallel mountain ranges (Lebanon Mountains and Anti-Lebanon Mountains) with temperate forests on their slopes, lies the Bekaa Valley with a very fertile soil rich of alluvional deposits. Along the cost vineyards, wheat, cotton, olive and orange plantations provide food for the population and some of the raw materials for the country's small-scale manufactures.

Land use: arable 29%, forest 8%, pasture 1%, other 62%.
Population employed in agriculture: 7%

Seed sector

Plant breeding. Plant breeding work is carried out at Agricultural Research Institute, Beirut; American University of Beirut, Beirut.

Variety release. The Ministry of Agriculture, the Agricultural Research Institute and the Cereals and Sugar Cane Office are responsible for evaluating and releasing new varieties. There are no restrictions in importing seed except for wheat and barley for which the public sector has its own seed production system.

Seed production. The Agricultural Research Institute produces pre-basic and basic seed of winter cereals and the Ministry of Agriculture controls production of registered and certified seeds.

Seed quality control. The Agricultural Research Institute and the Cereals and Sugar Cane Office have in charge seed testing, which is performed following ISTA Rules. Seed legislation was introduced in 1974 but is not fully implemented.

Seed marketing and distribution. The Cereals and Sugar Cane Office is the only official body responsible for cereal seed marketing. Seeds of other crops are imported by the private sector (about 30 importers are present).

Extension. Currently, the private sector is much more active in seed promotion than the official service.

Plant genetic resources

The following bodies are concerned with plant genetic resources: Agricultural Research Institute (Beirut) for cereals; American University of Beirut (Beirut) for pulses. There are no restriction on access to samples.

Copyrighted material

OMAN

The land

Oman occupies a strategic position on the southeastern edge of the Arabian Peninsula and flanking the Gulf of Oman, where oil tankers leave the Persian Gulf. It is separated from the rest of the peninsula by the Rub and Khali desert, which stretches, into the center of the country. Nomadic local groups now co-exist with petroleum and natural gas exploitation. Favored by ocean currents, the coastal regions enjoy a better climate. Monsoon summer rains fall in the north.

Land use: arable 0%, forest 0%, pasture 5%, other 95%.
Population employed in agriculture: 36.3%
Food production per capita: 100 (1979-81), 96(1990)

Seed sector

Plant breeding. Plant breeding of wheat, barley, and chickpea are performed at the Agricultural Research Center of the Ministry of Agriculture and Fisheries (Muscat). Selection of local varieties is carried out in other crops such as cowpea, sorghum, and berseem.

Variety release. Material from international trials and nurseries, particularly ICARDA is tried at several locations including farmers' fields. Following the trials, the Official Release Committee of the Department of Agricultural Research releases superior varieties.

Seed production and supply. The Government carries out seed production, particularly for wheat and barley. The seed is purchased from farmers at an incentive price and treated and stored in Government warehouses, ready for distribution to farmers, free of charge, in the following season.

Seed quality control. There is no specific seed legislation. The Department of Agricultural Research maintains a seed testing facility, mainly of germination tests, at the Rumais Research Station.

Seed storage. Two public seed store of 5 and 10 ton capacity are present in the country.

Application of plant biotechnology

No information is available.

Plant genetic resources

In collaboration with IPGRI, germplasm of local landraces were collected and stored in the country or in ICARDA. Wild relatives of wheat and barley were collected from the mountain areas. Collections of wheat, sorghum, millet, faba beans, chickpeas, cowpeas, lucerne and tobacco are held by the Department of Agricultural Research, Ministry of Agriculture and Fisheries, Ruwi, Muscat.

PAKISTAN

The land

Located between 23 & 37 North and 61 & 75 East. High mountains (Himalayas) in the north-east with heavy rainfall, mostly in summers, Hindu Kush Mountains in the west that are mostly dry and receive winter rainfall, irrigated Indus plain covering the provinces of Punjab and Sindh that is the mainstay of national agriculture. Mostly arid with hot dry deserts of Cholistan in Punjab and Thar. In Sindh there is extensive irrigation system with 4 large dams and numerous barrages.

Land use: Geographical area 79.6 mha, cropped area 22.2 mha (28%) of which 81% is irrigated, forests 4.5%. Main crops are wheat, rice, cotton and sugarcane. Agriculture sector 25% of GDP, 45% labour force employed in agriculture, main industries and exports agriculture based. Exports rice and cotton; imports wheat, edible oil and tea.

Seed sector

Plant breeding: Overall co-ordination of plant breeding research by PARC and PCCC (cotton only), Research undertaken by the provincial agricultural research institutes at Faisalabad (Punjab), Tando jam (Sindh), Sariab (Baluchistan) and Tarnab (NWFP), agricultural universities of Punjab, NWFP and Sindh, and the Atomic Energy Agricultural Research Centers. Main breeding effort on wheat, rice, cotton, sugarcane and pulses. Close association with concerned CGIAR centers, which also supply germplasm. Little research in developing hybrids.

Variety release: Elaborate procedure. Breeders submit seed samples to National Seed Registration Department to determine distinctness, uniformity and stability (DUS). Simultaneously the variety evaluation committee determines value and cultivation use (VCU). Varieties meeting DUS and VCU requirements released by the provincial seed councils if limited to individual provinces or by the National Seed Council if intended for cultivation in several provinces.

Seed production: In the public sector, the Punjab Seed Corporation, Sindh Seed Corporation, and the Agriculture Development Authority in NWFP responsible for seed production. Seed multiplication of approved varieties done through contract growers and on government farms Seed quality control: Federal Seed Certification Department responsible for quality control. Genetic purity of the crop checked in the field and purity of seed in the laboratory. Research institutions are responsible for the quality of pre-basic and basic seed while FSCD is responsible for controlling the quality of certified and approved seed sold domestically and the exported and imported seed.

Seed processing: Mainly in the public sector plants at Sahiwal and Khanewal in Punjab and Sakrand in Sindh. Private sector seed producers mostly in cotton. Multinationals - Cargill and Pioneer produce hybrid maize and fodder and process in their plants.

Marketing and distribution: Punjab Seed Corporation distributes seed through 1064 outlets-827 seed dealers, 30cooperatives, 15 sale points and 192 sale depots of Punjab agriculture and supplies organization; Sindh Seed Corporation has 89 sale outlets, ADA in NWFP has 50 sale points throughout the province In Baluchistan, seed is sold directly to the farmers by the Extension wing and the research institutes. Multinationals and private sector seed companies sell their seed through their designated agents and directly from their outlets.

Extension: No special organization for dissemination of information in improved seed. Agriculture extension departments mostly promote the use of improved varieties. Virtually no research in seed physiology, processing and seed treatment. Extension wing lays out variety demonstration plots of important crops for farmer education.

Application of plant biotechnology

Research in plant biotechnology especially the use of tissue culture for propagation and variety improvement and genetic engineering is done at the Center of Excellence in Molecular Biology, Punjab University, Lahore and the nuclear Institute for Biotechnology and genetic engineering, Faisalabad. National Agricultural Research Center, Islamabad also undertakes research in tissue culture to improve several crop species. Main emphasis in crop biotechnology on cotton, rice, sugarcane, chickpea, date palm, potato and other vegetable crops.

Copyrighted material

Plant genetic resources

Collection, preservation, evaluation and maintenance of plant genetic resources are the responsibility of the National Bureau of Plant Genetic Resources of the PARC, which has, elaborate facilities for seed preservation.

QATAR

The land

The country consists of the Qatar peninsula, on the eastern coast of the Arabian Peninsula in the Persian Gulf. The land is flat and the climate is hot and dry. Farming is possible only along the coastal strip. The country's main resource is its fabulous oil wealth on the western coast.

Land use: arable 0%, forest 0%, pasture 5%, other 95%.
Population employed in agriculture: 2.8%

Seed sector

Plant breeding. The local plant breeding Institution is the Department of Agricultural and Water Research in Doha. Imported material of wheat, barley, alfalfa, sorghum, millet and some vegetables is screened for local use.

Variety release. At the Department of Agricultural and Water Research a list of recommended varieties of wheat, barley, sorghum, pearl millet is present.

Seed quality control. There is no seed legislation in force

Seed storage. Seed storage facilities are limited due to the relatively low quantities of seed produced. In the country there are presently two public seed stores, one for wheat (10-t capacity) and one for barley (50-t capacity).

Seed marketing and distribution. Market is free and open.

Application of plant biotechnology

No information available.

Plant genetic resources

No programs on local genetic resources preservation are carried out. All genetic resources are imported from CIMMYT, ICARDA, and ACSAD as active collections for evaluation and multiplication under local conditions.

KINGDOM OF SAUDI ARABIA

The land

The vast Arabian Peninsula has two major desert regions: the An Nefud in the north, and the Rub al-Khali in the south. Between the two lie the Nejd massif, of volcanic origin, and the plain of El Hasa, the country's only fertile region, where wheat and dates are cultivated, thanks to a scanty rainy season. The country's cultivated land amounts to less than 1%; about 90% of the agricultural products consumed are imported. Oil is the main source.

Land use: arable 1%, forest 1%, pasture 40%, other 58%.
Population employed in agriculture: 35.8%
Food production per capita: 100 (1979-81), 236(1990)
Food import dependency: 87%

Seed sector

Plant breeding. Plant breeding work is carried out at: the Agricultural Research Department of the Ministry of Agriculture and Water (Riyadh) on wheat, barley, sorghum, maize, soybean and potato. The National and Agriculture and Water Research Center (Riyadh) on melons and watermelons.

Variety release. New varieties of wheat and barley are selected by the Agricultural Research Department in the Ministry of Agriculture and Water (NAERC) and tested by the Grain Silos and Flour Mills Organizations (GOSFM). Import of wheat seeds is subject to regulations issued by the Ministry of Agriculture and Water after consultation with the Wheat Board of the NAERC and the GOSFM. For evaluation of new cultivars of melon and watermelon the regulations of the American Society for Horticultural Science are followed. Although no official release committee is present, the Ministry of Agriculture and Water makes recommendations concerning the cultivars more suited for the country.

Seed production. The main seed production organization for wheat and barley is the National Seed of Agriculture Service Co. (Riyadh).

Seed quality control. The competent organization for supervising seed quality control is the National Agriculture and Water Research Center (NAWRC) of the Ministry of Agriculture and Water in Riyadh. AOSA and ISTA Rules for testing seeds are followed.

Seed processing. The main seed processing plants are in the private sector under the National Seed of Agriculture Service Co.

Seed storage. Some stores of the public as well as the private sector are available for storage of wheat, barley and potato.

Seed marketing and distribution. The larger local seed marketing companies for wheat and barley are: National Seed and Agriculture Service Co. (Buther). Hail Agriculture Development Company (Hadco). The National Agriculture Development Company (Nadec). Tabuk Agriculture Development Company (Tadco). Al-Gasseem Agriculture Company (Al. Gasseem). Ash-Shariqiah Agriculture Development Company (Shadco). Al-Jouf Agriculture Company (Al-Jouf).

Extension. The main organization involved with seed promotion is the Agricultural Research Department and the Agricultural Extension Department, Ministry of Agriculture and Water, which organizes training courses.

Application of plant biotechnology

The Date-Palm Research Center at King Faisal University, Hofuf, conducts extensive advanced research into date-palm propagation through cell and tissue culture. Several reports dealing with date-palm tissue culture have been published in the ten years in national and international Conference and Symposium Proceedings. At King Saud University in Riyadh, experiments were carried out on in vitro micropropagation of plants such as pomegranate and on the propagation of medicinal plants. A tissue culture laboratory has been set up in the Ministry of Agriculture and Water in Riyadh. Its research will focus on micropropagation of major crops such as date palm, potato and wheat. At present a national biotechnology advisory group with the participation of government agencies, industry and universities, as well as the Arab Gulf University in Bahrain, is setting up. Its main tasks are to initiate and co-ordinate a biotechnology program, to develop a biotechnology information base for Saudi Arabia, to organize training programs and workshops on specific aspects of biotechnology, and to promote interaction between various disciplines and industry.

Plant genetic resources

No Institutions involved in programs on local genetic resources preservation are known.

SYRIAN ARAB REPUBLIC

The land

To the west, near the sea, lies the Lebanon mountain range. To the south there are semi-desert plateaus and to the north low plateaus along the basin of the Euphrates River. Farming - grains, grapes and fruits - is concentrated in the western lowlands that receive sufficient rainfall. In the south, the volcanic plateaus of the Djebel Druze are extremely fertile farmlands, some as the oases surrounding the desert, the main one being that of Damascus. Cotton and wool are exported.

Land use: arable 30%, forest 4%, pasture 43%, other 23%.
Population employed in agriculture: 21.8%
Agricultural production index: 100 (1979-81), 83 (1990)
Food production per capita: 100 (1979-81), 82(1990)
Food import dependency: 29%

Seed sector

Plant breeding. Plant breeding is the responsibility of the Directorate of Agricultural Scientific Research (DASR), Douma, Damascus, and it is focused on the following crops: wheat and barley, maize, chickpea, lentil, groundnut, faba bean, sesame and sugar beet. Varieties are also developed by the Arab Center for Studies of the Arid Zones and Dry Lands (ACSAD, Damascus); the International Center for Agricultural Research in the Dry Areas (ICARDA, Aleppo).

Variety release. Variety evaluation is performed by the Directorate of Agricultural Scientific Research (DASR) or through joint activities with ACSAD and ICARDA. The release of varieties is subject to scrutiny by the National Release Committee based on submissions by DASR.

Seed production. Seed production of wheat, barley, maize, broad beans, chickpea, lentil, groundnut, cotton and potato is performed by the staff of the General Organization for Seed Multiplication (GOSM) in Aleppo.

Seed quality control. There is no legislation specific to seeds matters, which are included in an old Ministerial Decision issued in 1963 dealing with all agricultural inputs. The responsibility for seed quality control is with the General Organization for Seed Multiplication (GOSM).

Seed marketing and distribution. Seed marketing is carried out through three main channels: GOSM, the Agricultural Credit Bank, and the General Organization for Livestock.

Application of plant biotechnology

Research is being conducted at the Faculty of Agriculture, Aleppo University, on the use of tissue culture to propagate broad bean from different tissues in various nutrient media. Virus-fee potato tubers were produced at the Ministry of Agriculture, Aleppo.

Plant genetic resources

The organization responsible for genetic resources are: International Center for Agricultural Research in the Dry Areas (ICARDA), Aleppo, dealing with: Cicer arietinum, and *Cicer sp., Lens culinaris, Vica faba, Pisum sativum, Hordeum vulgare, Hordeum spp, Aegilops spp., Triticum aestivum, Triticum dicoccoides, Triticum durum, Zea mays.* Genetic Resources Unit (GRU), Agriculture Research Directorate, Douma, Damascus, dealing with: *Cicer arietinum, Lens culinaris, Vicia faba, Avena sativa, Hordeum vulgare, Hordeum spp, Oryza sativa, Sorghum bicolor, Allium spp.* Cotton Bureau, Ministry of Agriculture and Agrarian Reform, Aleppo, dealing with: *Gossypium spp.*

TURKEY

The land

The European part, located in the extreme south-east of the Balkan Peninsula makes up less than one-thirtieth of the country's total land area; it includes an arid steppe plateau, the mountains to the east, and a group of hills suitable for farming. Anatolia is a mountainous area with many lakes and swamps. The Ponticas range in the north and the Taurus range in the south from the natural boundaries for the Anatolian plateaus. The country is mainly agricultural. The lack of natural resources and absence of capital and appropriate infrastructure, have been major obstacles to industrialization.

Land use: arable 36%, forest 26%, pasture 11%, other 26%.
Population employed in agriculture: 44.5%
Agricultural production index: 100 (1979-81), 97 (1990)
Food production per capita: 100 (1979-81), 98(1990)
Food import dependency: 5,2%

Seed sector

Plant breeding. Plant breeding is performed by public and private sector. Several Public Institutions are involved in plant breeding, among which: Çukurova Agricultural Research Institute (Adana); Mediterranean Agricultural Research Institute (Antalya); Aegen Agricultural Research Institute (Menemen-Izmir); Southern Anatolia Agricultural Research Institute (Diyarbakir); Eastern Anatolia Agricultural Research (Erzurum); Black Sea Agricultural Research Institute (Samsum); Trakya Agricultural Research Institute (Edirne); Geçit Kusagi Agricultural Research Institute (Eskinsehir); Forage Crops Research Institute (Yalova-Istambul); Vegetable Research Institute (Antalya); Agricultural Research Institute (Akçakale); Bahri Dagdas Winter Cereal International Research Institute (Konya); Maize Research Institute (Sakarya).

Variety release. The official body for variety release is the Variety Release Committee composed of members of research institutes of MAFRA, Faculty of Agriculture, and Variety Registration and Certification Institute. The agency responsible for variety registration is the Directorate of Seed Registration and Certification Center in Ankara.

Seed production. Public and private seed production organisations are present as well as multinationals (Pioneer, Cargill, CIBA-GEIGY, Sandoz etc.). Among the public organisations the most important are: TIGEM in Ankara (public; T.Z.D.K. in Ankara (public), Antbirlik in Antalya (public)

Seed quality control. The Ministry of Agriculture, Forestry and Rural Affairs enforces seed law, since 1963. Seven official Seed Testing and Certification Stations are present in the country at Ankara, Gebze-Kocaeli, Izmir, Antalya, Içel, Diyarbakir, and Samsun. Seed testing is carried out conforming to ISTA Rules.

Seed processing. Seed processing is performed by public (TIGEM, T.Z.D.K.) as well as private sector.

Seed marketing and distribution. The seed producing organisations market their seeds through their own outlets and agencies. Seeds are transported mainly by trucks and other road vehicles. Seed production and marketing activities in the public and private sectors are based on a free market economy. Prices are not controlled. Trade in seed of foreign origin is subjected to law restrictions.

Extension. Demonstrations are conducted by the Provincial Seed Testing and Certification Stations and also the private organizations, in farming conditions, for the promotion of new seed varieties.

Application of plant biotechnology

Plant biotechnology research began in 1973 at the University of Ankara and there are now 18 plant tissue culture laboratories in various Turkish universities and research institutions. Research at the University of Ankara is concerned mainly with the use of tissue culture techniques for breeding vegetable crops and propagating fruit and vine. Other research concerns biological control of plant pests by Bacillus species. Research in the Horticulture and Plant Production Departments of the University of Çukurova concentrates mainly on in vitro propagation of plants such as banana, citrus, tea, artichoke and strawberry, but also on haploid plant production and the production of pathogen-free plants through somaclonal variation.

Other research includes: the use of anther and meristem cultures for propagating potatoes and tobacco (University of the Aegean); in vitro vegetative propagation of 13 crops (Institute of Aegean Agriculture Research); research related to early detection of plant pathogens using immunological technique (Institute of Tubitak Gebze Research for Basic Sciences); genetic variation in barley callus culture (University of Istanbul). Major advance have been made in the production of haploid lines via anther culture in pepper and tobacco, and in the commercial application of tissue culture technique in plant propagation and pathogen elimination by the Horticulture Research Center of the Ataturk Institute, where virus-free strawberry plants have been produced. Two private companies have commercialized in vitro propagation of ornamental plants. Co-operative arrangements between different Institutions in Turkey and International Organizations have resulted in collaborative projects on: virus-free citrus plants; establishing and promoting new biotechnological techniques; breeding through gynogenesis, performed by the University of Çukurova in co-operation with the French Institut National de la Recherche Agronomique (INRA).

Plant genetic resources

The Institution is involved in germplasm collection is: Plant Genetic Resources Research Institute, Aegean Agriculture Research Institute (AARI), Menemen, Izmir, dealing with: *Cicer sp., Lens culinaris, Vicia faba, Phaseolus vulgaris, Phaseolus coccineus, Phaseoulus spp., Pisum, Vigna, Avena spp., Hordeum spp., Oryza sativa, Secale spp., Aegilops spp., Zea mays, Abelmoscus esculentus, Allium spp., Raphanus sativus, Brassica spp., Capsicum annuum, Citrullus spp., Cucumis spp., cucurbita spp., Lycopersicon lycopersicum, Solanum melongena, Daucus carota, Lactuca spp., Spinacia oleracea, Beta spp.*.

UNITED ARAB EMIRATES

The land

Located on the strategic cape controlling the Arabian and Oman Gulfs, the country has seven emirates. The coastal areas are hilly lowlands with coral islands offshore and dunes. Most of the oil fields are located in these areas. Several oasis break up the desert.
Land use: arable 0%, forest 0%, pasture 3%, other 97%.
Food import dependency: 98%

Seed sector

The Ministry of Agriculture and Fisheries reported in 1985 that no seed programmes in the country were present. No other more updated information is available.

Plant genetic resources

No Institutions are known to be involved in programs on local genetic resources preservation.

YEMEN

The land

North Yemen has the most fertile lands of the Arabian Peninsula. Beyond a semi-desert coastal strip along the Red Sea, lies a more humid mountainous region where the agricultural lands are found. The traditional coffee crop was replaced by qat, a narcotic herb. The climate is tropical with high temperatures especially in Tihmah and in the eastern region. The southern territory is dry, mountainous and lacks permanent rivers. Two thirds of its land area is either desert or semi-desert. The country's agriculture (millet, cotton and coffee) is concentrated in the valleys and oases (1,2% of the territory) Fishing is an important commercial activity.

Land use: arable 3%, forest 8%, pasture 30%, other 59%.
Population employed in agriculture: 53.2%
Agricultural production index: 100 (1979-81), 79 (1990)
Food production per capita: 100 (1979-81), 79 (1990)

Seed sector

Variety development and Release: Variety development is the responsibility of the Agricultural Research and Extension Authority (AREA) and it's several regional centers. New varieties are released after review by the Variety Release Committee.

Seed production. A Seed Production Project (SPP) is carried out to obtain basic seeds of wheat, maize, sorghum and millet. Since 1986 a Seed Multiplication Farms operational for multiplication of first generation wheat and barley seeds. Seed production of potatoes is responsibility of the Seed Potato Distribution in Sana'a. No potato seed may be imported without the approval of this organization.

Seed quality control. There is no seed law. Quality control is developed according to international standards in the Seed Production Projects. A fully equipped testing laboratory is present in Taiz. Samples of seeds produced in the centers of the SPP are tested for moisture content, purity, germination and vigor.

Seed marketing and distribution. Seed marketing for the grain crops is by SPP and for potatoes by the Seed Potato Distribution. Some potato seed is distributed through private agents, the Rural Development project and credit banks.

Extension. An extension service is present which perform seed demonstration and marketing. Farmers receive credit from the Co-operative Agricultural Credit Bank

Plant genetic resources

The organization responsible for genetic resources is Department of Research & Extension, El-Kod Agricultural Research Center, Ministry of Agriculture & Agrarian Reform, Abyan Goy, dealing with: or, *Triticum aestivum*, *Zea mays*.

This document has been prepared by the Seed and Plant Genetic Resources Service (AGPS) of the Plant Production and Protection Division of the Food and Agricultural Organization of the United Nations to be used as a working paper to stimulate debate in the meeting on Seed Policy and Programmes in the Near East and North Africa.

The present document was developed based on 22 Country Reports by Member Governments, FAO expert consultation reports in the region, and national and regional workshop reports on issues related to seed production and distribution in the Near East and North Africa. This document is based on the work of Dr. Luciana Quagliotti and Dr. Sergio Lanteri of Plant Genetic Research Institute at the University of Turin, Italy. Dr. Edward Herath, former head of the Department of Agricultural Research in Sri Lanka also contributed. Comments and suggestions from Dr. N. Murthi Anishetty, and Dr. Ivan Sikora, were incorporated into the document. The technical analysis and elaboration of this technical document was accomplished by Dr. Victor N. Bushamuka, Cornell University, Ithaca, NY.

The document received a major contribution from Dr. Mohamed S. Zehni, who made the final revision and the conclusive analysis of the document.

This work has been developed under the technical guidance and scientific coordination of Dr. U. G. Menini, Chief of Seed and Plant Genetic Resources Service.

MANAGEMENT, CONSERVATION AND UTILIZATION OF PLANT GENETIC DIVERSITY IN THE NEAR EAST AND NORTH AFRICA (NENA)[1]

Mohammad TAEB
AERO, Ministry of Agriculture., Teheran, Iran

I. INTRODUCTION

1.1 The Region and its Agro-Ecological Conditions

In this analysis, the Near East and North Africa (NENA) region comprises 27 countries[2]. It covers a large area of 1,682,282,526 hectares, out of which 98,340,860 hectares or 5.8 % are cultivated. Countries of the region include Afghanistan, Algeria, Bahrain, Cyprus, Djibouti, Egypt, Iran, Iraq, Jordan, Kuwait, Kyrgyzstan, Lebanon, Libya, Morocco, Oman, Pakistan, Palestine, Qatar, Saudi Arabia, Sudan, Syria, Tajikistan, Tunisia, Turkmenistan, Turkey, United Arab Emirates, and Yemen. In 1995, the population of the region was nearly 522 million people and, if the current trend continues, it is expected to grow to over 800 million by the year 2020 (FAO 1999).

The region is a net importer of food. The value of food imported into the region increased from 22 billion US$ in 1990 to over 29 billion US$ in 1997 (FAO 1999), an increase of nearly 30%. Saudi Arabia, Turkey, and Egypt are the largest food importing countries. In general, agricultural imports in the region have by far superseded agricultural exports. Wheat, for which the region is ironically regarded as the center of diversity, is among the major items in the import bill. In 1996, the NENA region produced 12.7% of the world's production of wheat, whereas it imported 22.9% of the total world imports of the same crop (FAO 1999).

The region is primarily arid and semi-arid, and average national annual precipitation varies from 18 mm per year in Egypt to 827 mm per year in Lebanon. Variability in altitude and precipitation has resulted in the establishment of different types of climates in various parts, hence creating conditions for the survival and evolution of a large diversity of plant species as well as diversity within species. Low level of industrialization and high economical dependency on agriculture in many countries make utilization and conservation of Plant Genetic Resources for Food and Agriculture (PGRFA) diversity a challenging issue in the region. This issue could have an important impact on agricultural development. Establishing policies for agricultural development or PGRFA management in isolation without considering their interrelationship could produce serious imbalances in the future.

1.2 Nature of Agricultural Development in the Region

Agricultural development of countries in the region is dependent to a large extent on the economic structure of the country. Based on their Gross Domestic Product (GDP), the region can be divided into three economic groups. The high-income group of countries includes Oman, Saudi Arabia, Libya, Cyprus, United Arab Emirates, Qatar, Bahrain and Kuwait, all which have a GDP of more than US$ 6,000 per capita per year. The middle income group of countries include Turkey, Iran and Iraq with their GDP ranging between US$ 1,500 – 6,000 per capita per year. Low income countries of the region that have less than US$ 1,500 per capita per year include Afghanistan, Algeria, Tunisia, Lebanon, Yemen, Pakistan, Syria, Morocco, Egypt, Syria, Jordan, Palestine (ICARDA 1997a), Djibouti, Kyrgyzestan, Tajikistan and Turkmenistan.

According to the World Bank (1998), the share of agriculture in the GDP of countries varies between 0-52%. In oil rich and low populated countries such as Kuwait and Saudi Arabia, the shares of the agricultural sector in the GDP are generally small. For instance, in Kuwait the agricultural sector contributes about 0.0% and in Saudi Arabia the share is 1.0% of the GDP. In contrast, the shares tend to be higher for less oil-rich and highly populated countries. For example, the agricultural sector contributes about 52% of the GDP of Kyrgyzestan (World Bank, 1999).

---

[1] Detailed data related to PGR in the NENA region are presented in annexes 1-5

[2] Country in this report imply country and territory

1.2.1 Structure of the agricultural sector: weaknesses and strengths

The agricultural sector in NENA is charactetized by small and fragmented holding size farms. In such holdings, modern and appropriate agricultural practices are seldom used, resulting in low productivity. Agricultural production in NENA is almost entirely operated by the private sector; a large percentage of the labor force is employed in agriculture. Depending upon the country, the percentage of the labor force engaged in agriculture varies between 1 - 70% (ICARDA 1997a). A high percentage of the labor force engaged in agriculture leads to an increase in the disintegration of land, a reduction in the efficiency of production, and limitation in the application of new technologies for higher production. Among countries of the region, Egypt has the highest added value per hectare of land, whereas Lebanon has the lowest added value (World Bank, 1998).

1.2.2 A fragile ecosystem, the limitation to traditional agriculture

As indicated, the NENA region is primarily arid and semi arid; drought, salinity, heat and short growing periods are characteristics of the environment in this region. Desertification is rapidly progressing in part due to of unsustainable agricultural practices in parts of the region. Currently, most countries are faced with serious soil erosion, loss of arable land, loss of water resources and loss of species diversity as forests and woodlands disappear and range lands transform to deserts.

Much of the agricultural production is conducted through irrigated agriculture and about 25% of irrigated agriculture in the region use traditional methods (FAO, 1998. 1999). However, the expansion of this agricultural system is limited by water availability. In most countries, water removal is more than the annual precipitation. This situation has increased salinization of most irrigated land.

1.2.3 Genetic erosion, the cost of past development

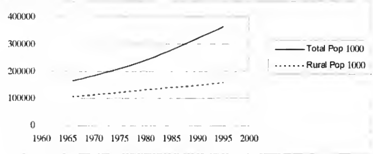
Erosion of genetic diversity is a continuing process and there are many factors that contribute to this phenomenon. In major food crops, replacement of land races by improved cultivars has had major impact on genetic diversity. Other factors that have had negative effects on genetic diversity include grazing, urbanization, land degradation and ecosystem imbalances. According to FAO, the area under permanent pasture and forest in the Near East has almost remained constant from 1966 to 1994 while, cheep production during 1966 to 1996 almost doubled. This production is believed to cause the disappearance various plants in pastures (Table 1).

Rapid increase in human settlement often results in genetic erosion. Over the past 30 years FAO (1999) has observed a rapid growth in urban populations compared to rural populations (Fig. 1). Unfortunately, there is a general shortage of data on species composition and density to assess the impact of urbanization on genetic diversity in the region.

Table 1. Land use and value in the Near East[1] (FAO 1997b).

Land / Production	year	Value
Arable land (1000 ha)	1966	81,523
	1995	89 ,62
Irrigated land (1000 ha)	1966	15,553
	1994	27,122
Permanent pasture (1000 ha)	1966	1,210,076
	1994	1,211,493
Forests (1000 ha)	1966	1,995,348
	1944	1,902,354
Mutton and lamb (1000 MT)	1966	717
	1996	1,422
Milk (1000 MT)	1966	8,912
	1996	18,463

Fig. 1[1]. Growth of urbanization in the Near East (FAO, 1999)



2. PLANT BIODIVERSITY IN THE NENA REGION

2.1 Flora of the Region

The region is rich in Plant Genetic Resources for Food and Agriculture (PGRFA). It is estimated that the Mediterranean and North Africa sub-region along with west and central sub-region of NENA have a flora of 32,000 and 15,000 species, respectively (Zehni, 1998). Among the flora of the region, there are many plant species of global food importance, which have their center of diversity in the region. These include wheat, barley, oilseed rape and chickpea. These species constitute almost 38% of the world dry matter in food production. Turkey and Iran have the highest plant diversity in the region (FAO, 1998b and World Conservation and Monitoring Center, 1999).

Copyrighted material

2.2 Conservation Capacity of Plant Genetic Resources in the Region

2.2.1. Ex situ holding

According to country reports[3] and the World Information and Early Warning System (WIEWS) database (FAO 1997a), only 14 countries in the region have an ex situ collection. The largest ex situ collections are in Iran, Turkey and Pakistan, and only these countries have cold storage facilities for long-term storage. The number of accessions stored in *ex situ* collection across the region is estimated to be around 138,664 (FAO, 1998b and World Conservation and Monitoring Center, 1999), which is 2.6% of the global *ex situ* collection.

Because there are large gaps in collections, *ex situ* holdings of the Region, do not fully represent the genetic diversity of the countries. These gaps are due to a lack of collections in areas that have never previously been explored and distant species that have not been regarded of any use in the past.

Member countries of WANANET[4] have identified gaps in *ex situ* collections and prioritized areas and species for collections. Although much of the *ex situ* collections of the region are duplicated in other national and international collections either inside or outside the region, the extent of duplication is not clear and the identification of gaps in the regional collection remains difficult. Some of the oldest collections from the region are hold in genebanks in Japan and Russia.

The size of *ex situ* holdings of countries of the region depends on the national policies and efforts of the country preserving its PGRFA, as well as on the richness of plant biodiversity cover of the country. Hence, comparisons of conservation status from one country to another require that a link between the size of *ex situ* and the number of species in the local flora be established.

Identifying the size of *ex situ* holding, in relation to the diversity of flora in the country could provide a basis for comparison among countries in their effort to conserve their PGRFA diversity. This comparison could be estimated by the Coefficient of Protection Effort (CPE), which is estimated by dividing the number of accessions held in *ex situ* by the total number of species in the flora. Further elaboration of CPE requires information on several aspects of *ex situ* conservation. These include information on the quality of *ex situ* maintenance, the extent of *ex situ* genetic erosion, the number of accessions collected in the country vs. the number of accessions repatriated, relative abundance of accessions within species, and the number of species out of the total flora.

Among the countries in the region, Cyprus has the highest CPE, followed by Iran, Egypt, Syria and Turkey. Although Iran, Turkey and Pakistan have the largest *ex situ* facilities and holdings in the Region, when expressing their holdings in relation to the overall flora biodiversity available in the country, it appears that further efforts are needed in the collection of PGRFA in these countries (FAO, 1998b and World Conservation and Monitoring Center, 1999). Considering the richness of the flora and the number of accessions maintained in *ex situ*, Iran has one of the strongest PGRFA programs in the region.

2.2.2 In situ conservation

In situ conservation is carried out in protected areas[5] in the region (FAO, 1998b and World Conservation and Monitoring Center, 1999). These areas vary largely in size and percentage as related to the size of the country. The largest protected area of nearly 12 million hectares is in Algeria and the

---

[3] Country reports presented in the preparatory phase for the International Technical Conference on Plant Genetic Resources

[4] West Asia and North Africa Network of Plant Genetic resources, coordinated by IPGRI regional office in Syria.

[5] Protected areas refer to areas, which are in conformity with the criteria defined by World Conservation Monitoring Center and having a size of more than 1000 hectares.

Copyrighted material

highest percentage of protected area is in Oman where 13.7% of the country is protected (FAO, 1998b and World Conservation and Monitoring Center, 1999).

Most countries in the region fall short of the average world protected areas (6.9%) expressed by the size of protected area as a percent of total area (FAO, 1998b and World Conservation and Monitoring Center, 1999). For the majority of protected areas, the extent of inventory listing of species, the degree of protection, and the monitoring of changes and dynamics on species composition are unclear. There are currently 5 GEF projects, with total fund of about US $10,794, that have direct relevance to protected areas in the Region (CHM 1999)

2.2.3 Conservation of NENA's PGRFA outside the region

Germplasm from the region is extensively maintained in genebanks located in other parts of the world. They are in genebanks maintained by various institutions including national governments, the Consultative Group on International Agricultural Research (CGIAR), and other international and private organizations. Collections from NENA countries in the CGIAR centers are relatively well maintained and many of them have been characterized.

The *ex situ* collection of the genus *Triticum*, which is the main component of *ex situ* collections across the region and for which the region is known to be the center of diversity, constitutes 39,953 accessions in the region. However, according to WIEWS this represents only 5.3% of the global *Triticum* ex *situ* collection. The rest of *ex situ Triticum* collection is in other genebanks outside the region. Other species native to the region such as barley and chickpea are also mainly maintained in genebanks outside the region. As a result, the overall material maintained in the region is only a small fraction of that outside the region.

3. UTILIZATION OF PLANT GENETIC RESOURCES IN THE REGION AND AGRICULTURAL DEVELOPMENT

Conservation of plant genetic resources has wide implications on food security. The main driving force for the conservation of PGRFA is believed to be the utilization of these resources. Utilization is referred to as the mechanism that derives benefits from plant genetic resources through agricultural practice. However, agriculture can disturb natural ecosystems and pose a threat to the conservation of plant genetic resources. Agriculture can also reduce diversity with potential use in agriculture. Therefore, the pattern and characteristics of agricultural development is important for the conservation and utilization of PGRFA

Breeders have been the main beneficiaries of collections of *ex situ* material and the prime concern in making collections has been the utilization of the collected resources. However, in recent years breeding material or crossing blocks are mostly supplied by International Agricultural Research Centers (IARC) such as CIMMYT, ICARDA and ICRISAT. As a result, national programs tend to use less their native PGRFA for breeding purposes. Breeding materials supplied by the CGIAR centers have been characterized and are easy to use. The main effort required by the breeder is the selection of crossing blocks. On the other hand, PGRFA accessions held in national genebanks are usually kept as heterogeneous populations, and as a result, it is difficult to work with them.

3.1 Partners in Utilization of PGRFA for Sustainable Development of Agriculture

3.1.1 National agricultural research systems and the conservation of PGRFA

National Agricultural Research Systems (NARS) are composed mainly of public research institutes and universities. While research institutes are involved in full time research, university activities are mainly teaching oriented with limited research. A study conducted by FAO (1996a) revealed that the research potentials of universities in Egypt, Jordan, Morocco, Sudan and Tunisia are all under utilized.

The study stressed the importance of developing measures to facilitate effective use of these capacities to address national agricultural research priorities.

The scientific capacity of NARS in the region is variable in terms of human as well as physical capacity and funding (World Bank, 1998). Existing capacities are mostly focused on a few important priority crops, and these crops are also given priority in conservation programs. Distant relatives are usually not among the priority species in conservation efforts.

3.1.2 Seed production and its impact on conservation of genetic diversity

The informal seed sector has been an important partner in the conservation of PGRFA. Farmers have maintained large germplasm resources as landraces. Once again, utilization has been the main driving force in farmer germplasm conservation. Although the number of landraces that are maintained by farmers is unknown, it is clear that farmer landraces constitute a large-part of seed in the Region.

It is estimated that there are 400 different types of crops cultivated in the Region. Although most of these crops have direct relevance to food consumption, many of them are non-food crops. In any case, maintenance of these crops by farmers, although very important, should be viewed as complementary to other conservation methods.

3.1.3 Farmers participation in the conservation of plant genetic resources

The improved seed production capacity of the region is unable to meet requirements of the farmers. Therefore, farmers must save their own seeds for the next season. Furthermore, the breeding capacity and improved seed production in most countries is concentrated only on a few important field crops. Seeds of the remaining crops are produced and maintained by farmers. In the case of perennial crops such as horticultural fruit trees, (breeding capacity in the region is almost non-existent and most trees are grown from seeds), farming communities maintain a large part of the genetic variability in the region.

Since utilization has been the prime incentive for farmers to conserve genetic diversity, selection has been carried out according to their food needs. As a result, farmer collections are biased and do not represent the real PGRFA diversity available in the country. A lack of available technologies to farmers limits their ability to utilize plant genetic resources and associated conservation practices.

Private seed sectors also have a stake in conservation of PGRFA. However, their main concern is the utilization of PGRFA in breeding or in some instances in the biotechnology industry. Country reports prepared for the Global Plan of Action (GPA) reveal that in 1995 there were no private industries active in plant breeding in the NENA region. The private sector is only active in the production of certified seed, a complementary activity to the ongoing practices of the public sector. Foreigners in the private sectors are mostly involved in hybrid crop production for which royalties are ensured by the technology rather than patent or plant variety protection laws.

3.2 National Policies and Utilization of PGRFA

National policies are reflected in the developmental plan of the country where relevant legislation is established and priorities are accordingly set up and given to various programs. As all the countries of the region are food importers, food production remains a primary concern, which is reflected, in the national policies. It is estimated (Zehni, 1998) that in the Near East[6] 72% of increased food production comes from plant genetic diversity. Therefore, the conservation of PGRFA is regarded as an important component in food production. This is only possible if plans of actions are prepared with PGRFA in mind. In addition, other relevant sectors of the government should coordinate efforts to ensure the conservation and utilization of PGRFA.

---

[6] Near East as defined by FAO geographical distribution of countries.

3.2.1 National agricultural priorities and concerns to PGRFA

The countries of the region rely heavily on agriculture in their GDP. This is due to a high proportion of economically active members of the population in agricultural sector, a poor industrial infrastructure and an increase in population creating a high proportion of young job seekers. Agriculture, for most countries of the Region, particularly those with a large population in the middle income group, could provide economic advantages if issues related to PGRFA conservation and utilization are appropriately addressed.

The globalization of trade and the Uruguay Round Agreement is expected to affect agricultural development in the region. It is forecasted by FAO that the prices of some major food crops could rise as much as 7% in the region. Therefore, agricultural development, particular in food importing countries, is considered a priority activity at the macroeconomic level.

Within the context of agricultural development, plant breeding is critical for the sustainable use of resources and an increase in food production. This is particularly important when considering that fresh water is limited in the region. Therefore, the development of technologies in the utilization of PGRFA for sustainable use of water must be a priority in the region.

3.2.2 Legislation requirements

Although in most countries agriculture is directed under a single ministry, it is also affected by policies adopted by other ministries within the government. Plant genetic resources are a concern of agricultural ministry and other ministries dealing with environment. Other policies and legislation affecting land reform, employment, industrialization and trade policies also could also have implications on agriculture, which in turn could affect conservation and utilization of plant genetic resources.

It is often difficult to coordinate the activities of the players involved in the conservation and utilization of plant genetic resources. Therefore, preparation of legislation should clearly define the responsibilities and role of all stakeholders involved. The development of legislation relating to the conservation and utilization of plant genetic resources should take into consideration the broader context of agricultural and economic development of a country.

3.2.3 Global influence on national policies related to PGRFA

There are global conventions and agreements with varying degree of relevance to conservation and utilization of plant genetic resources for food and agriculture. Different international agencies are responsible for the implementation of these conventions, and national ministries or departments of the member countries collaborate as national focal points. Collaboration among these international implementing agencies should promote the cooperation of different sectors of the governments.

Insufficient coordination between international implementing agencies creates duplication of the national level among sectors working in biological activities. This problem has been clearly stated in country reports on biological diversity. Based on the Egyptian and Turkish country reports it can be said that the representation of agro-biodiversity appears unproportional and poor to the importance and impact of agriculture on overall biological diversity of these countries.

By recognizing that agro-biodiversity is a major component of biological diversity, FAO and the Secretariat of the Convention on Biological Diversity (CBD) in 1997 signed a memorandum of cooperation that named FAO responsible for the development and operation of Clearing House Mechanism for agro-biodiversity. The further integration of FAO in this effort is an essential step to ensure success and achievement of the objectives of CBD. FAO's role should have a positive impact on the coordination of activities at the national level.

3.3 Privatization Policies and its Impact on PGRFA

It is believed that plant breeding activities and seed trade, when in the hands of the private sector, might have positive effect on the conservation and utilization of PGRFA. For the private sector to be involved in breeding and seed trade would require that appropriate measures that could guarantee profits are taken. These measures include the control of seed market and the establishment of national long-term policies on Intellectual Property Rights (IPR).

Although utilization of PGRFA might be improved by greater involvement of private sector, the conservation of PGRFA should remain the responsibility of national governments.

3.3.1 Seed production

While agricultural production is mainly in the hands of the private sector mainly composed of farmers, in most countries of the region, the seed industry is controlled by the public sector. Only a limited quantity of seed is produced by the private sector. The public sector is responsible for the production of pre-basic or basic seeds and certified seeds of major food crops. Whereas the private sector, is only involved in the production of certified seeds of cross-pollinated crops and some hybrid seeds. Depending on the country and its legislation, the private seed sector may exist in the form of company, a cooperative or individual farmers operating under contract. In general, the private sector usually lacks structure and organization as well as capital for investment and development in the region.

Farmers maintain a large proportion of seeds of improved cultivars for their own use. However, these seeds usually lose their genetic purity after several growing cycles. Pricing polices of certified seeds, lack of availability of adapted improved cultivars, and ineffective seed distribution systems and poor extension services are among the reasons farmers maintain their seeds.

The extent to which farmers maintain seeds varies according to on the crops. In the case of cash crops, where there is differential pricing based on consumer preference farmers follow the rules of the market and get access to quality seeds in accordance with the market demand. In contrast, in other crops where the market is dominated by the presence of the government with little consideration of seed quality and consumer preference, there is a stronger tendency for farmers to follow their traditional methods of seed procurement.

Seed trade in the region is very small compared to the global seed trade of over US $30 billion. In countries where data was available, the import of seed cost US $180-200 million per year while export reaches US $20-30 million each year (ICARDA and GTZ, 1997). In Egypt, where the annual internal seed market is US $140 million (ASSINSEL, 1999), the private sector is involved in seed production of self-pollinated crops. The private sector produces 5%, 10%, and 15% of the seed requirements of wheat, sorghum, and rice, respectively (ICARDA and GTZ, 1997). In Morocco, the annual internal seed market is US$ 160 million (ASSINSEL 1999). However, despite the existence of 140 private seed companies, seed production makes up only 5% of the seed market of the country and the remaining seeds are provided through the public sector (ICARDA and GTZ, 1997).

In Pakistan, where 51 private seed companies exist, many of the companies are not functional (ICARDA and GTZ, 1997). In Sudan, where private seed production is also encouraged, farmers in a cooperative system with the government produced 100% of cotton and wheat seed requirement, 40-60% of sorghum seed requirement and 3% of groundnut seed requirement (ICARDA and GTZ, 1997). In Jordan, only 30% of the area under crop production uses improved cultivars (Country reports, GPA).

In Tunisia, only 12% of the national requirements for seeds of improved varieties are met by quality seed are produced by four seed companies, two of which belong to the private sector (ICARDA and GTZ, 1997). In Turkey, there are 32 private and 38 public seed companies producing quality seeds of improved varieties. The private sector produces one third of the improved seed requirements of the country and the remaining seeds are provided by government institutes (ICARDA and GTZ, 1997). In Cyprus, seed production is firmly in the hands of the public sector. Reliable farmers and growers under contract with the government produce certified seeds out of the pre-basic and basic seeds received from the government. However, this meets only 50% of the national need for certified seed in cereals (ICARDA and GTZ, 1977). In Jordan and Syria, there are no private seed companies and, as a result, all seeds of the improved varieties are produced by the government. In Lebanon, the total seed market is estimated at US $28 million annually, and only US $0.67 million comes from the public sector (ICARDA and GTZ, 1997). In Yemen, there are five government owned seed centers. However, reliable farmers produce certified seeds under government contracts (ICARDA and GTZ, 1997). In Iran, production of pre-basic and basic seeds of improved cultivars is in the hands of public institutes. However, government contracted farmers carry out further production of certified seeds.

3.3.2 Plant breeding capacity and objectives in NENA

Plant genetic resources from the region have widely been used in breeding programs around the world in either national programs or in CGIAR centers. Within the region, the use of PGRFA in research activities carried out by public institutes has mainly been conducted to meet immediate national food needs.

The fragile and harsh environment of the region requires efforts in adapting plant varieties to abiotic and biotic stresses. Drought, salinity and heat are the major abiotic stresses in most crops including wheat, barley, chickpeas, alfalfa, lucerne and date palm. Tolerance to these stresses is often one of the major goals of national breeding programs in the region. According to ICARDA (1997b), the number of cultivars released by national programs in 1981-1997 using material received from ICARDA, were 120 for bread wheat, 68 for durum wheat, 62 for barley, 43 for chickpea, 24 for lentil, and 35 cultivars were released for other crops (ICARDA, 1997; AGRIS, 1998). It appears that Egypt, Iran, Turkey, Algeria and Morocco have released more improved varieties than any other countries in the region, whereas countries such as Afghanistan, Kuwait, Bahrain, Saudi Arabia, and UAE have not released any or only a few cultivars.

Breeding for high yields has been a major objective in the region for many years. However, high yielding varieties also require high input. With decreasing water resources for irrigation and water withdrawal exceeding water replacement in the majority of countries in the region (FAO, 1997b, 1999), it is essential that the objective for high yield consider high yield per unit water consumed. In this regard, there is a need to utilize more modern breeding methods, which should include multidisciplinary approaches and other practices that exploit the natural genetic diversity for higher efficiency in water use. Genetic engineering and biotechnology can also be used to maximize yield per unit of water used. These technologies could eliminate some of the barriers in the transfer of diversity across distant relatives and reduce the time required for rearrangements of genes.

Country reports indicate that plant breeding capacity varies across countries of the region. Table 5 lists some indicators, which represent the breeding capacity and efforts to utilize plant genetic resources in the region. FAO (1998a) indicates that from 1997 to 1998 PGRFA was more widely studied in Egypt, Iran, Turkey, Pakistan and Morocco. However, the entire region constitutes only 4.5 to 5.3% of the total studies on PGRFA worldwide.

3.3.3 Agricultural research capacity essential for utilization of PGRFA

In countries where the economy is more dependent on agriculture, there is a reasonable link between the GDP generated by agriculture and expenditures on agricultural research and development. In their last meeting, member countries of the Asia and Pacific Association of Agricultural Research Institute (APAARI) recommended that resources allocated to agricultural research and development be between 1-2% of the GDP generated by agriculture (APAARI 1998). Based on this recommendation, the expenditures expected in the NENA countries are presented in Annex 1.

Expenditure incurred for research and development in most countries of the region is unknown. However, according to the World Bank, Egypt spends 1%, Turkey 0.8% and Tunisia 0.3% of their Gross National Product (GNP) on research and development. The I. R. Iran spends 0.31% of it's GDP on research and development. Compared to the developed world, where on average more than 2% of the GDP is allocated to research and development, these NENA figures appear to he low (World Bank, 1998).

Current expenditures of Egypt, I. R. Iran, Turkey and Tunisia on agricultural science and development are expected to be approximately US$ 115, 69.7, 246 and 8 million respectively. All of the country budgets fall short of the minimum advocated by APAARI.

Some countries of the region, such as Iran, Egypt, Turkey and Morocco, have an infrastructure for plant breeding (ICARDA, 1997; AGRIS, 1998). However, there is not a proportionate relationship between the size of the ex *situ* holding and expenditures made in agricultural research and development. For instance, despite the fact that Egypt has the highest budget for agricultural research and development, its genebank is not yet fully developed and Egypt has one of the lowest *ex situ* holdings. In contrast, while Turkey has a small budget for agricultural research and development, it has a genebank as well as almost three times more *ex situ* holdings than Egypt. There appears to be a need to review the agricultural research and development policies and to define clearly the position of genetic resources with regard to agricultural development priorities.

Production of improved cultivars is the applied utilization of genetic diversity for food and agriculture. In a study conducted in Iran from 1985-1995, AREEO[7] 1996 concluded that the minimum cost of development of the new wheat cultivar "Ghods" was US$ 4.5 million. The study also found that the minimum rate of return of the capital investment was 59% per year. Since similar studies carried out elsewhere show the same results, it was concluded that investment in breeding programs is a viable and profitable investment. However, many NARS in the region fail to benefit from this investment opportunity. A shortage of public sector funding, the absence of a clear private investment policy and lack of awareness on the value and extent of economic opportunities available in the utilization of PGRFA are among the important reasons.

3.4 Scientific Capacity and Requirements for the Utilization of Plant Genetic Resources

PGRFA could be used for agricultural production through a range of technology applications. Breeding involves a range of practices from simple selection among diverse populations to genetic manipulation through transformation and creation of new gene combinations or creation of new diversity through mutation. The choice of breeding technology depends on a number of factors including the availability of a research infrastructure and facilities, trained human resources, adequate funding, clear objectives and policies and access to information and relevant material.

3.4.1 Technology requirements for utilization of plant genetic resources

Modern plant breeding requires a package of technologies that when integrated can increase the value of plants or other related genetic diversity. The ability to utilize genetic diversity depends on the availability or accessibility of related technologies in the country, which is determined by several factors including national priorities, investments on science and privatization policies.

New technologies available allow breeders to utilize a wider range of PGRFA. Advances made in biotechnology, genetic transformation and marker assisted selection along with doubled haploid production technique can all accelerate the breeding process. The following biotechnology techniques are used on PGRFA in the region:

(i) Doubled haploid production in wheat, barley and cotton to shorten the breeding time.

---

[7] Agricultural Research, Education and Extension Organization, Ministry of Agriculture, I.R. Iran

(ii) Doubled haploid production to develop sorghum-inbred lines required in hybrid sorghum breeding.
(iii) Embryo rescue techniques and wide crosses in cereals.
(iv) Low cost, simple marker technology such as isozymes and PCR based markers for marker assisted breeding in wheat, barley, sorghum, chickpeas, lentil, sugar beet and cotton.
(v) Micropropagation and production of virus free plants by tissue culture in horticultural plant such as date palm, apple, walnut, pistachio, almond and olive.

The above mentioned techniques are regarded as equally important in plants foreign to the region such as maize and rice, which are widely cultivated and bred in some countries. Transgenic plants in crops such as cotton carrying BT gene may soon be available in markets in the region. On the other hand, due to costs and other limitations such as patents, genetic transformation in comparison to the above techniques, at the moment, appears far from being widely applied in the region.

3.4.2 Availability of technology and trained staff

A recent report by Madkour and Hamdan (1998) indicated that biotechnology capacity exists in most countries of the region. However, the report failed to provide information and data on human resources, funding and research capacities. Present expenditure on research and development and the number of scientists in countries are important indicators of the national scientific capacity.

Based on the available information, it appears that Egypt, Tunisia, Libya and Iran have the highest number of scientists (World Bank, 1998). These countries have 458, 388, 361 and 338[8] scientists per one million of the population respectively. Among the countries, which provide data on expenditures on research and development, Egypt and Iran incur the highest costs. The number of cultivars released by national programs could also be a reliable indicator of national scientific capacity. However, this indicator does not reveal the type of technology employed.

3.4.3 Access to technology in other countries

Access to foreign technology can be facilitated in a number of ways such as through the exchange of scientists and training of students overseas, joint scientific collaboration through bilateral cooperation agreements, and membership in PGRFA networks. Access to technology could also be mediated through CGIAR research centers, as technology transfer to developing countries is an important component of the CGIAR mandate. Quantitative indicators to measure access to technology in the field are scarce, it is therefore important that technology transfer is considered in future analysis of utilization of PGRFA.

There is a general understanding that the Intellectual Property Rights (IPR) could facilitate access to technology (Art 19 CBD). This is particularly true in industries where IPR are considered important; it is argued that potential suppliers of technologies are more willing to transfer technology voluntarily if the host country has an effective IPR regime in place (COP 1996). Although this would facilitate the importation of IPR protected goods, technology transfer would only be possible if appropriate national policies establishing functional research units, funding mechanisms, privatization and foreign investment, and related legislation are adopted. The convention on Biological Diversity (CBD) and the Global Plan of Action (GPA), two of the international mandates with direct relevance to utilization of plant genetic resources for food and agriculture, have provided the legal framework essential for access to and transfer of technology. Eighteen countries in the region have already ratified CBD (Table 2); articles 16, 18 and 19 of CBD call upon parties to take measures for effective technology transfer. In addition, 22 countries of NENA have adopted GPA (Table 2) and have committed to the Leipzig Declaration to facilitate access to and transfer of technology in support of world food security.

---

[8] Full time researchers

Table 2[1]. Ratification status of various international conventions and other legal obligations related to the conservation and use of PGRFA.

Country	GPA	CBD	UPOV	WTO	ISTA[2]	CITIES	World Heritage	Combat Desertification	Climate Change	Patent Treaty	WIPO
Afghanistan	X					X	X	X			
Algeria	X	X		O		X		X	X		X
Bahrain	X	X		X			X	X	X		
Cyprus	X	X		X	X	X	X		X	X	X
Egypt	X	X			X	X	X	X	X		X
Iran	X	X			X	X	X	X	X		
Iraq	X						X				X
Jordan	X	X		O		X	X	X	X		X
Kuwait	X			X				X			X
Lebanon	X	X						X			X
Libya	X							X			
Morocco	X	X		X	X	X	X	X	X		X
Oman	X			O			X	X	X		X
Pakistan	X	X		X	X	X	X	X			X
Qatar	X	X		X			X		X		X
Saudi Arabia	X			O		X		X	X		
Sudan	X	X		O		X	X	X	X	X	X
Syria	X	X						X	X		
Tunisia	X	X		X	X	X	X	X			X
Turkey	X	X		X	X	X	X	X		X	X
UAE				X				X	X	X	X
Yemen	X	X				X	X	X	X		X
Djibouti		X		X		X			X		
Kyrgyzstan		X		X			X			X	X
Tajikistan							X		X	X	X
Turkmenistan	X	X					X	X	X	X	X

O=observer; X=convention ratified. 1 Compiled from ratification status lists available on the web and other sources; 2 International Seed Testing Association

§Data not available for country of Palestine, and Blank cells also indicate non-available data.

4. REGIONAL INFORMATION MANAGEMENT

Constructing comprehensive information system for PGRFA has been adopted as priority 17 of the GPA. In the CBD, article 17 also calls upon parties to facilitate the exchange of information from all publicly available sources. Within the region, IPGRI and ICARDA play an important role in facilitating the dissemination of information.

4.1 Documentation

For an effective information exchange, it is essential first to have information recorded and documented and then disseminated through the appropriate channels. Country reports indicate that the status of documentation of data on PGRFA in the region varies among countries. It appears that Iran, Pakistan and Turkey, in comparison to other countries of the region, have more extensive documentation on PGRFA, which are computerized. The need to strengthen the capacity for documentation and assign priority to this activity have been stressed in the regional meeting to promote the implementation of GPA held in 1998 in Syria.

4.2. Dissemination Systems

Internet facilities and computer applications are available to various degrees among countries of NENA. Data from the World Bank indicate that at least twelve countries in the region have access to the Internet (World Bank, 1998). The same source of data indicate that Kuwait, UAE, Egypt, Saudi Arabia, Algeria and Iran have a reasonable number of computers per 1000 people when compared with the world average. However, the extent to which electronic documentation of PGRFA materials is available in some of the above countries appears to be limited. Provided that computers and the Internet are available, electronic information systems are the cheapest means of information dissemination. In other countries, access to computers appears limited. However, with the current trend in the computer industry, it is expected that technology will soon be available at a reasonable cost to all countries of the region.

4.3 Availability of Information and its Impact on Conservation/Utilization of Plant Genetic Resources

Availability of documented information is an essential tool for policy direction and planning at all levels of decision making. Priority area 20 of the GPA recognizes the importance of the availability of information to promote public awareness. Lack of awareness among policy makers in the region has been raised as one of the constraints in the implementation of the GPA.

The examination of international obligations made by countries in the region reveals a failure to integrate activities related to the conservation and utilization of PGRFA into national plans. This is an indication of the negative impact that in adequate information on the importance of PGRFA can have on policy makers. In addition, the reluctance of breeders to utilize PGRFA in their breeding programs is usually attributed to a lack of available data on the potential values of PGRFA as well as breeders preference of crossing blocks received from CGIAR centers.

5. INTERNATIONAL CONVENTIONS AND LEGAL OBLIGATIONS RELATED TO PGRFA AND THEIR IMPLEMENTATION IN THE REGION

The international Convention for the Protection of New Varieties of Plants (UPOV) is an international mandate with direct relevance to the utilization of PGRFA. However, none of the countries in NENA are members of UPOV. This indicates that NENA countries are less involved in international activities related to plant breeding and that efforts are focused on domestic demand. Lack of involvement in such an important international convention explains why seed export in the region is only US$ 20-30 million while seed import is around US$ 180-200 million (ICARD/ GTZ 1997).

Eleven countries in the region are members of the World Trade Organization (WTO) and bound to its rules (Table 2). In addition, 19 countries are members of the World Intellectual Property Organization (WIPO) and there are seven others that are members of the Patent Cooperation Treaty (Table2). The Uruguay Round Agreement of negotiations under the General Agreement on Tariffs and Trade (GATT) produced the Trade-Related Intellectual Property Rights (TRIPS) Agreement, which commits all members of the WTO to adopt and enforce minimum levels of protection for IPR. Article 27.3(b) of the Agreement on TRIPS calls for members to develop Plant Variety Protection legislation. However, none of the countries in the region that are member of WTO have yet developed Plant Variety Right legislation. Iran is developing a *sui generis* system on plant variety protection.

The genetic diversity of the region is eroded by many factors including the export of medicinal plants. Many of medicinal plant species are harvested in the wild and there is no mechanisms in place to monitor the dynamics of such species. The hard currency earning through the uncontrolled exportation of this material would lead to the erosion of at least some of the genetic diversity in this group of plants. Therefore, plant diversity; particularly of medicinal plants, should be subjected to the regulation of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

6. RELATIONS AND CO-OPERATION WITH OTHER REGIONS

The science of plant genetic resources is relatively new and, as a result, there is shortage of expertise and trained personnel. Implementation of CBD and GPA requires well-trained personnel. Sharing experience among countries both within the region as well as outside the region would also enhance the implementation of the CDB and GPA.

There are a number of crop specific networks in the region coordinated by ICARDA in which countries from other regions participate as well. There is also a plant genetic resource network, West Asia and North Africa Network (WANANET), which coordinated by the International Plant Genetic Resources Institute (IPGRI) and the Association of Agricultural Research Institute in the Near East and North Africa (AARINENA) and assisted by international bodies. There are other crop-specific networks that are coordinated by FAO and some of the countries in the region as well as countries from other regions. These networks provide an important platform for scientific and germplasm exchange. There can be many possibilities for scientific exchange including information exchange on *ex situ* holdings, sharing of training and funding opportunities, dissemination of research results and matters related to the utilization of PGRFA. The recently established Global Forum on Agriculture is expected to push for partnership in agricultural research on commodities and promote collaboration in the management of plant genetic resources worldwide.

Several of the CGIAR centers are active in the region and provide scientific support to countries. ICARDA, IPGRI, International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), International Maize and Wheat Improvement Center (CIMMYT), International Service for National Agricultural Research (ISNAR) and the International Potato Center (CIP) are among the most active centers in NENA. As the technology provided by the CGIAR centers is free from limitations imposed by IPR, assistance from the centers has allowed countries of the region to bridge some gaps in technology.

7. FUTURE OUTLOOK AND RECOMMENDATIONS

Conservation and utilization of PGRFA can only be realized if it is developed within the context of agriculture. Therefore, it is important that the economic importance of the agricultural sector be clearly defined. This would enable other sections within the government such as budget and planning, the legislative system and other ministries to adopt policies supportive of agriculture and, in particular, conservation and utilization of agro-biodiversity. It is recommended that governments develop their medium term agricultural development strategies and clearly define the position of PGRFA in their programs.

The conservation of PGRFA should be seen as an important part of biodiversity. In this regard, it is essential that the coordination of activities between all stakeholders be developed at the national level through the establishment of committees with strong legal status and authority to take appropriate decision.

Information on the regional potential and capacity in the utilization of PGRFA should be shared through the establishment of technical groups on the utilization of PGRFA. Within these groups, the exchange of PGRFA material such as crossing blocks and breeding material, scientific information and training on particular themes could be developed in accordance with international obligations and bilateral arrangements.

For effective implementation of CBD and GPA, it is recommended that appropriate articles be included in the national development plan of governments.

It is recommended that appropriate legislation in support of the private sector such as the recognition of the IPR, and that foreign investment on plant breeding industry be developed. This would encourage the utilization of PGRFA. To this end, it is important that investment opportunities on agricultural research in the field of plant breeding and utilization of PGRFA be identified and brought to the attention of potential investors.

Appropriate legislation should be developed to ensure seed security to farmers through mechanisms that ensure that only seed of given standards are multiplied and distributed in the country

Organizations that are active in the region such as the Islamic Bank, IFAD, FAO and CGIAR centers should give special priority in establishing appropriate platforms for the exchange of scientists and material and technology related to the conservation and utilization of PGRFA. These exchanges should be established through partnerships on research and the development of the conservation and utilization of PGRFA and should include countries in the region and outside the NENA region.

WANANET could serve as an information platform for the region. It is recommended that some support provided by international funding organizations in the region be channeled through WANANET. Funding can be used to enhance regional activities and potentials and promote partnerships among countries of the region on conservation and utilization of PGRFA. WANANET could also help to monitor the implementation of relevant international obligations related to PGRFA.

It is recommended that countries in the region generate data on various quantitative indicators, which demonstrate their management of and achievements towards the conservation and utilization of PGRFA. This could provide an additional dimension to PGRFA in future agricultural planning.

It is recommended that at least 1% of agricultural GDP be given to agricultural research. It is further recommended that agricultural research be prioritized such that an effective PGRFA program be planned and integrated within NARS in support of sustainable agricultural development.

It is recommended that more efforts be made by NARS in the region to utilize local genetic resources in breeding programs. This is important because CGIAR breeding materials are getting narrow in their genetic base.

It is recommended that FAO, with the support of the CBD and financial mechanisms at the disposal of the international community on agro-biodiversity, assists NENA countries to develop PGRFA programs integrated in national biodiversity plans and agricultural research and development.

8. REFERENCES

APAARI. 1998. Fifth General Assembly of ASIA-Pacific Association of Agricultural Research Institutions and the Expert Consultation on Research Management Mechanism of National Agricultural Research Systems, Republic of Korea 1998.

ASSINSEL (1999 on web). World Seed Statistics.

CGIAR. 1997. SINGER CD-ROM Database, CD version.

CHM (1999 on the web). List of GEF funded projects under the CBD.

COP. 1996. Conference of Parties to the Convention on Biological Diversity, UNEP/CBD/COP/3/22.

FAO. 1996a. The Role of Universities in the National Agricultural Research Systems of Egypt, Jordan, Morocco, the Sudan and Tunisia.

FAO. 1996b. The Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture.

FAO. 1997a. WIEWS Database, on diskette version 1.

FAO. 1997b. State of Food and Agriculture (Sofa 97) software.

FAO. 1998a. AGRIS Database, CD version.

FAO. 1998b. State of the world's plant genetic resources for food and agriculture

FAO. 1999. FAOSTAT Database

ICARDA, and GTZ. 1997. Privatization of the Seed Industry in the West Asia and North Africa Region.

ICARDA. 1997a. Rural Poverty and Natural Resources in Dry Areas: the Context of ICARDA's Research.

ICARDA. 1997b. ICARDA Annual Report 1997.

Madkour, M.,A and I.Y Hamdan. 1998. Prospects of Biotechnology in the Arab World, paper presented to the third Arab Conference on Modern Biotechnology and Areas of Application in the Arab World, Cairo, Egypt.

Zehni, M. 1998. AARINENA Towards 2000 and Beyond, a Strategy for the Future. Paper presented at the sixth General Conference of Association of Agricultural Research Institute in the Near East and North Africa, Tehran, Iran 1998.

WCMC. (1999 on web). 1996 Global Protected Areas Summary Statistics.

World Bank. 1998. World Development Indicators.

World Bank. (1999 on web). World Development Indicators

Annex 1 - Share of agriculture in GDP of NENA countries (World Bank 1998) and desirable expenditure on agricultural research and development (Million US $).

Country[§]	GDP in 1996	Percent of Agriculture in GDP in 1996	Desirable Research Expenditure	
			At 1% of Agri GDP	At 2% of Agri GDP
Algeria	45,699	13	59.4	118.8
Egypt	67,691	17	115.0	230.1
Iran	89,979[#]	25[#]	250	500
Jordan	7,343	5	3.6	7.3
Kuwait	26,650	0	0	0
Lebanon	12,997	12	15.5	31.1
Libya		2*		
Morocco	36,820	20	73.6	147.2
Pakistan	64,846	26	168.5	337.1
Saudi Arabia	126,266	1*	12.6	25.2
Sudan		34*		
Syria	17,587	20*	35.1	70.3
Oman	12,102	3*	3.6	7.2
Tunisia	19,516	14	27.3	54.6
Turkey	181,464	17	308.4	616.9
United Arab Emirates	39,107	1*	3.9	7.82
Yemen	6,016	18	10.8	21.6
Kyrgyzstan	1,754	52	9.12	18.2
Tajikistan	1,990[#]			
Turkmenistan	4,397[#]			

* Share of agriculture in GDP in 1980.

1997 figures (World Bank 1999).

[§] Data not available for countries of Afghanistan, Bahrain, Cyprus, Iraq, Palestine, Qatar and Djibouti

Blank cells also indicate non-available data.

Annex 2 - Agricultural production efficiency as indicated by agricultural added value and some factors affecting that. (World Bank, 1998).

Country	Agricultural value added per ha. 1992-94	Scientists and engineers in R & D per 1 million of population	Expenditure for R & D as % of GNP	Personal computers per 1000 people	Internet host per 10000 people July 1997
Algeria	180			34	0.01
Egypt	2,990	458	1.0	58	.031
Iran	696	338*	0.31#	32.7	0.0
Jordan	461			7.2	0.38
Kuwait	224			74.1	21.72
Lebanon	24	67			0.01
Libya		361			
Morocco	111			1.7	0.32
Pakistan	382	54		1.2	0.07
Saudi Arabia				37.2	0.15
Sudan				0.7	0.0
Syria				1.4	0.0
Oman	328			10.9	0.0
Tunisia	232	388	.3	6.7	0.02
Turkey	404	209	.8	13.8	3.6
UAE	2,076			65.5	7.6
Yemen					0.0
Kyrgyzstan	4				0.23
World	236			49.9	35.19

* Full time researchers

# As a percent of GDP

[§] Data not available for countries of Afghanistan, Bahrain, Cyprus, Iraq, Palestine, Qatar, Djibouti, Tajikistan, and Turkmenistan.

Blank cells also indicate non-available data.

Copyrighted material

Annex 3 - Water availability to agriculture in NENA countries[1]

Country	Cultivated area hectare		Irrigated land hectare		Renewable water per inhabitant 1995	Water withdrawal per inhabitant m^3		Population million	
	Year	ha	Year	ha	m^3	Year	m^3	1995	2020
Afghanistan	1990	3,344 ,00	1967	2,385,740	3,227	1987	1,702	19,661	40,955
Algeria	1993	3,372,000	1992	555,500	512	1990	180	557	816
Bahrain	1994	3,165	1994	3,165	206	1991	465	557	816
Cyprus	1994	111,649	1994	39,938	1,213	1993	331	745	925
Egypt	1993	3,246,000	1993	3,246,000	926	1993	913	62,096	90,606
Iran	1993	14,382,418	1993	7,264,194	2.044	1993	1,091	68,365	119,826
Iraq	1993	3,731,300	1990	3,525,000	3,688	1990	2,367	20,095	38,013
Jordan	1991	214,767	1991	64,300	161	1993	246	4.215	8,431
Kuwait	1994	4,770	1994	4,770	13	1994	348	1,691	2,752
Lebanon	1994	189,206	1993	87,500	1,465	1994	444	3,009	4,193
Libya	1987	2,278,648	1990	470,000	111	1994	880	5,407	11,448
Morocco	1993	7 232 700	1989	1,258,200	1,110	1991	436	26,524	37,801
Oman	1993	61,550	1993	61,550	455	1991	728	2,207	5,610
Pakistan	1990	16,556,000	1990	15,729,448	2,968	1991	1,277		
Qatar	1994	8,312	1993	12,520	96	1994	528	548	764
Saudi Arabia	1992	1,608,000	1992	1,608,000	134	1992	1,040	18,255	37,919
Sudan	1995	7,600,000	1995	1,946,200	3,150	1995	633	26,707	43,760
Syria	1993	4,938,670	1993	1,013,273	1,791	1993	1,017	14,203	24,563
Tunisia	1993	4,254,600	1991	385,000	463	1990	382	8,987	12,832
Turkey	1991	20,480,000	1994	4,185,910	2,967	1992	541	60,838	82,248
UAE.	1993	54,512	1995	66,682	79	1995	1,107	2,210	3,185
Yemen	1994	1,052,786	1994	481,520	283	1990	251	15,027	34,540
Djibouti	1989	407	1989	674	520	1985	20		
Kyrgyzstan	1990	1,323,400	1990	1,072,600	2,445	1990	2,527	5	5
Tajikistan	1992	812,000	1992	718,000	6,474	1989	2,065	6	7
Turkmenistan	1993	1,480,000	1993	300,000	17,321	1989	6,346	5	6

1 Extracted from FAO data sources.

Data not available for countries of Palestine and blank cells also indicate non-available data.

Annex 4. Size of *ex situ* holdings and *in situ* protected land area of the countries in the Region

Country	Floral diversity [*]	Number of accession	Accessions in the CGIAR collection[1]	Size of the protected area (ha)[2].	%land area of the country protected	*In situ* coefficient of protection efforts
Turkey	9,000	26869#	13,873	819,441	1.05	2.9
Iran	8,000	40000*	13,546	8,299,566	5.04	5
Morocco	4,500	3115#	4,892	362,120	0.79	0.69
Afghanistan	3,500	2965[$]	2,960	218,438	0.33	
Algeria	3,200	985[$]	55	11,919,288	5.00	
Palestine	3,000		1,191			
Iraq	2,921	6400*	1,047			2.19
Jordan	2,500	2642*	3,991	290,300	3.02	1.05
Yemen	2,336	4229#	2,759			1.81
Tunisia	2,150	504#	4,253	44,867	0.27	0.023
Pakistan	600	19208[$]	4,072	3,720,939	4.63	
Egypt	2,112	8914	1,729	793,200	0.79	4.2
Syria	2,100	8750*	13,968			4.1
Lebanon	2,100		1,506	3,500	0.34	
Libya	1,900	1750*	519	173,000	0.10	0.92
Cyprus	1,760	12313#	1,052			6.99
Saudi Arabia	1,737		71	6,201,400	2.58	
Oman	1,021	238[$]	301	3,736,250	13.74	
UAE	343		8			
Kuwait	235		0	27,000	1.11	
Qatar	221		0	1,619	0.14	
Bahrain	196		2			
Sudan		5,178#	3,590			
Djibouti			0	23,000	0.43	
Kyrgyzstan			9	198,500	1.43	
Tajikistan			115	143,100	0.6	
Turkmenistan	2,500	10,721[*]	152	488,100	2.28	

Extracted from WIEWS database; * Country reports for the preparation of GPA.; $ FAO (1998b).

[1] Extracted from SINGER database.

[2] World Conservation and Monitoring Center (1999); Blank Cells indicate either non-availability of data or non-applicable

Annex 5 - Utilization of plant genetic resources in the Region as indicated by number of articles appeared in AGRIS[1] and number of cultivars released by National Programs from ICARDA supplied material[2].

	Breeding[1]	Germplasm[1]	Genetic resources[1]	Barley	Durum wheat	Bread wheat	Chick pea	Lentil	Other crops
Afghanistan	2	1	1	0	0	0	0	0	0
Algeria	10	1	5	3	10	15	0	3	0
Bahrain	0	0	0	0	0	0	0	0	0
Cyprus	7	2	2	5	3	5	0	0	1
Egypt	168	9	6	3	5	20	1	3	8
Iran	40	8	19	6	3	21	4	0	1
Iraq	14	1	2	4	3	4	2	1	0
Jordan	10	3	3	1	4	3	2	1	3
Kuwait	0	0	0	0	0	0	0	0	0
Lebanon	4	1	0	3	3	3	2	2	3
Libya	0	0	0	6	12	3	1	1	0
Morocco	34	9	25	9	7	5	7	1	5
Pakistan	88	20	20	6	1	1	1	3	1
Qatar	0	0	0	2	0	1	0	0	0
Saudi Arabia	3	0	1	1	1	0	0	0	0
Sudan	61	7	9	0	1	4	2	2	8
Syria	61	0	20	3	5	6	3	0	1
Oman	0	0	0	0	0	2	3	0	4
Tunisia	18	0	7	5	3	4	5	2	0
Turkey	82	30	0	3	7	13	10	5	0
UAE	0	0	0	0	0	3	0	0	0
Yemen	2	1	1	2	0	12	0	0	0
Sum	663	98	129	62	68	120	43	24	35
As a percent of the total	5.3%	5.2%	4.5%	55.8%	81.9%	94.4%	68.2%	48.9%	94.5%

[1] Key words used in combination with names of countries using AGRIS 1997-1998

[2] ICARDA Annual Report 1997

[§] Data not available for countries of Palestine, Djibouti, Kyrgyzestan, Tajikistan, and Turkmenistan Blank cells also indicate non-available data.

NATIONAL SEED POLICY AND STRATEGIES FOR THE NEAR EAST AND NORTH AFRICA

A.J.G. van GASTEL; B.R. GREGG
IITA/GTZ Seed Project, P.O. Box 9698, Accra, Ghana; and
PO Box 1756, Starkville, MS 39760, USA

I. INTRODUCTION

Governments have the responsibility to ensure adequate food supplies at reasonable cost for all citizens. Policies must stimulate the development of the agricultural sector, which it is the backbone of the economy in most developing countries. For maximum effectiveness at least cost to national resources, seed of improved varieties should be a major concern, especially in an era of rapid population growth, economic re-structuring and need for more cost-effective and efficient use of resources.

In the majority of the developing countries, in the past fifty years, policies emphasized the role of the public sector in building the seed supply pipeline, resulting in large government seed programs and parastatals, which provided seed to farmers at subsidized prices. The private sector was hardly involved in providing seed to farmers. More recently, due to the emphasis on re-structuring, policy emphasis shifted to the private sector as the main actor to produce and market seed for farming communities Government policy is to be confined to legislation, quality control, extension and variety development.

I.1 Status

How successful have we been so far? Have past policies and strategies been able to stimulate the development of sustainable seed industries?

The status of the seed industry in the Near East and North Africa (NENA) compares favorably with the situation in sub-Saharan Africa, but compared to South America and South East Asia, seed industries are not well developed in several countries.

The majority of arable, certainly marginal, land is still planted with unimproved varieties. For many crops improved genetic material is available, but dissemination is slow and in small amounts. Quantities of Breeder Seed and Foundation Seed are often insufficient and of relatively low quality and seed promotion and education are neglected. Quality control programs are not providing the expected services. In spite of all the current emphasis, participation of the private sector is still relatively limited for important, often self-pollinating, food crops. This is due to the fact that the private sector has been given the responsibility without being given the incentives and conditions necessary for effective investment and operation.

The situation can be summarized as follows.

- Past Government seed production programs supplied seed at low cost, primarily because efforts were focused on "crash programs" to increase food production. Such programs were usually heavily subsidized. This has created an attitude among farmers that seed is inexpensive, which does not favor paying cost-covering –let alone profitable—seed prices.

- In some countries in the region, the seed program is still firmly in the hands of the public sector. In other countries, large scale seed production and marketing of important food crops is mainly in the public sector, but the public sector is in the process of building these operations into commercially-operated public seed enterprises or privatizing all operations. In an increasing number of countries, the 'real' commercial private seed sector (international and national) is becoming involved. However, this private sector mainly produces seed of profitable crops (hybrids, vegetables) for 'profitable areas' of the agricultural economy. Interest in the low-profit but essential basic food crops (wheat, sorghum, and legumes) is very limited or non-existent. Markets are small and there is no consistent demand for higher-cost improved seed due to unreliable climatic conditions, on-farm saving of seed, lack of farmer understanding. Competition between the private and the public sector is often perceived as not fair; governments often still subsidize public enterprises.

- In almost all countries, existing rules and regulations for (a) importation of varieties, (b) variety evaluation, testing and release, and (c) certification are still too bureaucratic and cumbersome. These rules and regulations do not favor introduction of the latest technology and fast release of improved genetic material.

- Development of new varieties, as well as quality control, is--in almost all countries--the 'monopoly' of the government. In a few countries private companies are involved in breeding work for non-strategic crops.

In general, it can be concluded that policies and strategies pursued during the past 50 years have not led to a situation where the formal seed sector is successfully meeting the needs of resource-poor farmers for the important food crops. The percentage of seed supplied by the formal seed sector is still very limited, and the informal sector still plays a major role in the majority of the countries in the region.

This paper will discuss some policy and strategy issues. It does not intend to re-invent the wheel, and it appreciates that several policies and strategies, which are currently pursued, are serving the purpose of building the seed industry. However, some existing policies, especially those developed when economic infrastructure and emphases differed, should be replaced with new forward-thinking policies. These policies should meet the needs of the current and anticipated situation of increased private sector responsibilities and application of business management and operating principles to seed production and marketing.

2. NATIONAL SEED POLICY

A policy is a definite course of action selected from alternatives in the light of given conditions to guide and determine present and future decisions. A policy expresses the Government's approach toward a certain issue. It is a guidance statement of intent and requirements. It does not focus on details; these are handled in regulations for implementation of specific laws. A policy establishes goals, directions, actions, responsibilities and roles in a form, which guide development and operation. Strategies are developed to adopt and implement a given policy.

A National Seed Policy deals with the seed industry's role in agricultural development, food security and food self-sufficiency. What is the role of yield-enhancing seed in agricultural productivity and production and how can maximum benefits of improved seed be attained? A Seed Policy is the first and most important step toward an adequate and stable supply of high quality seed. It is the primary and cheapest input for a productive agriculture, which is able to achieve food security and self-sufficiency.

An effective National Seed Policy must deal with important issues that have an influence on the production and supply of high quality seed. It must be long-term (have the force of Law) and have—and continue to have—the power to influence and guide the production and supply of seeds. Any law, regulation or action of any agency, which impinges upon production, distribution and/or marketing of seed, must be in compliance with the National Seed Policy. The Policy's influence should not be restricted to technical matters related to seed. For example, border custom control must not delay or interfere with timely shipment of seed into or out of the country.

A national seed council, or a comparable mechanism, with wide representation of the actors in the seed sector is essential to reach consensus and to help formulate policy and strategies for the future of the seed sector. Some countries in the region have a National Seed Board already composed and functioning. If no National Seed Board exists, other alternatives must be considered.

Some programs suffer from lack of continuity in goals for the seed industry and the policies and strategies to achieve them. Sometimes this weakness results from changes in government, but more frequently it is caused by changes in personnel and lack of structure to assure the needed continuity. One of the main advantages of a National Seed Board, if it is properly used, is that it provides a structure through which greater continuity of goals and policies can be achieved. Seed legislation, if carefully drafted, can also provide continuity of policies.

In the remaining part of this paper the following policy issues will be discussed: (a) the role of different actors, (b) liberalizing and privatizing the sector, (c) quality control, (d) the informal sector, (e) emergency and disaster relief, and (f) harmonization. Although important policy issues, such as (i) crop and seed research, (ii) testing and release, (iii) variety protection, (iv) credit for the seed industry, and (v) seed import and export are not discussed in this paper, they should be part of any comprehensive National Seed Policy.

Annex 1 includes a basic format for a "Model Development-Oriented National Seed Policy" which includes most of the essential elements. This was prepared as a guideline for countries of the region, not only to help them establish or complete effective Seed Policies, but also to promote uniformity among countries in Seed Policy, which is the first step toward regional cooperation and efficient seed supply.

3. ROLES OF MAIN ACTORS

The two main actors are the public sector and the private sector. Governments must focus on supporting roles (variety development, legislation, quality control, etc.) and creating a market for seed (extension promotion of farmer understanding of, and willingness to purchase, more expensive but higher-yielding seed). Government supporting roles are not limited to agencies involved in agriculture; tax, duty, traffic control, police, import/export, etc., also impact upon seed production and marketing and must also be subject to the influence of the National Seed Policy. The private sector's role is to conduct market-responsive commercial operations of seed production and marketing. Today's "buzz phrase" for re-structuring seed is "Government promotion must create a farmer market for seed; the private sector will then produce and distribute to satisfy this market".

Government must also carefully avoid competition with the private sector, as well as avoiding undue control or restriction of private sector business operations and response to market conditions. A clearly defined separation between these two roles must be maintained. At the same time, there must be close cooperation and mutual support between the two sectors.

4. LIBERALIZING AND PRIVATIZING THE SEED SECTOR

Past experience has shown that the private sector is more efficient at market-oriented commercial operations than are government "administration-focused" agencies. In view of the growing need to produce more from the use of increasingly scarce resources, today's trend worldwide, is economic re-structuring, with Government withdrawing from commercial or market-oriented operations and leaving these to the private sector.

The agricultural sector has been one of the first areas re-structured. Most large general agricultural activities have now been privatized (food, grain, fertilizer) in the majority of the countries in this region.

Copyrighted material

The private sector is now also expected to take responsibility for producing and marketing seed and planting material to farmers. However, it must be appreciated that:

- Seed is living material, sensitive to humidity and temperature.
- Large volumes are involved, but only a small amount is sold to each farmer.
- Farmers live in many villages, often remote with poor roads and communication.
- Farmers often do not have cash to pay for purchases.
- Seed are not bought year-round; the need for seed is seasonal and extremely time-sensitive.
- Production involves a time lag of 2-4 years.
- Seed alone has no value; the farmer needs related inputs.
- Appearance of seed does not indicate its quality.
- High technology, requiring additional costs, is involved in producing, processing, and delivering improved seed.
- Farmers are not sufficiently educated by Government to create a consistent seed market.
- The price farmers will pay for seed is often little more than the grain price.

In fact, anything that affects agriculture—from weather to market prices—not only affects the production of seed, but also the ability of farmers to use and/or purchase seed.

Therefore, seed production and marketing is a high-risk, high technology, high cost business, with long recovery periods for investment. It is often a low profit business, and the seed sector is usually not the most attractive alternative for investment of private sector funds and efforts. Private sector investors are not easily willing to make large long-term investments unless they are assured that known and favorable conditions will prevail throughout the life span of the investment.

Effective liberalization and privatization of seed production and supply can, therefore, only take place if a strong, well-focused National Seed Policy creates business/economic conditions favorable to private sector investment in seed. The policy must remain essentially unaltered for the long-term. In several cases, re-structuring has only achieved Government withdrawal from seed production and supply, without significant subsequent takeover of responsibilities by the private sector, because of the lack of an adequate National Seed Policy and incentives for investment in seed.

To privatize the seed sector requires specific Government incentives to attract investment in seed production and supply. In too many cases, Government has provided inadequate incentives to attract the required private sector investment.

To create a favorable economic environment in which seed enterprises can operate efficiently, Government actions must include the following:

- Establish a long-term National Seed Policy, with the effect of law. This should specify needs, participants, roles, and Government guarantees and actions.

- Establish a special Investment Promotion Law, which identifies priority areas into which Government wishes to attract private sector investment. This offers significant and specific incentives to private enterprises, which invest in these priority areas. Seed should be a priority area for a relatively long period; *i.e.*, the time required to establish stable seed industry operations. Incentives offered are concessions, which reduce the cost of establishing and operating an enterprise, and thus improve its profitability and reduce operating risks. Incentives should be offered to both domestic and foreign investors. Some investment incentives offered by some countries, usually for a specified number of years, include:

  a) Freedom from income tax.
  b) Freedom from business, sales and other taxes.

c) Freedom from import taxes on necessary equipment and operating supplies.
d) Freedom from taxes on land, buildings, vehicles and other real property used in the operations.
e) Freedom from taxes on exports of seed produced above the national requirements or market demands.
f) Special loans from Government, at low interest rates. For operating credit, seed stocks should be accepted collateral.
g) Freedom to hire Government personnel, sometimes without the employee losing his Government retirement benefits.
h) Government-supplied services, such as electricity and water, at concessional prices.
i) Land for offices/factories in special Government-designated industrial areas, at reduced prices or no cost.
j) Guaranteed freedom from competition by Government agencies, such as Government seed programs.
k) Assistance from all Government Agencies, such as Agricultural Extension and Research.
l) For foreign investments (either joint ventures or wholly-owned), freedom to repatriate earnings without taxation.
m) Freedom from duty on the importation of inbred lines.
n) Access to public varieties, as well as Breeder and Foundation Seed of varieties developed by the public sector.

Unfortunately, seed development in this region has not yet benefited adequately from such investment promotion programs.

- Establish a free capital market to encourage private investment.

- Set up rural credit programs to ensure that farmers can get credit (preferably credit in kind, rather than cash) to buy seed from any reliable dealer (not limited to government agencies). It is important to ensure that credit policies include all financial institutions, and that credit supports development of the quality-oriented seed industry and private sector.

- Allow free marketing and pricing system (no price control).

- Strengthen extension to create farmer understanding and use of improved seed.

Subsidies: Subsidies are contrary to present economic trends in which Government makes no investment, and the private sector conducts and finances market-oriented operations. Subsidies are not conducive to good business management of the private sector enterprises. If certain subsidies are deemed necessary for a healthy seed sector for essential basic crops, such subsidies should be given equally to both public and private sectors; it should be clear what is subsidized, and for how long. It should be relatively easy to withdraw the support.

However, investment incentives—not subsidies—are essential to attract cost-effective and well-managed private sector investment.

5. QUALITY CONTROL

Several seed quality control approaches are used in the world; the "Comprehensive Regulatory" and the "Truth in Labeling" systems are the most common. It is also widely accepted that in many developing countries, seed quality control systems are not strong and often lack adequate funding.

The "Quality Declared Seed" system, developed by an FAO expert consultation, is designed to provide a quality control system that is less demanding on government resources but is adequate to provide good quality seed to farmers. The proposed system leaves the responsibility for the quality with the producer (internal quality control), while government checks only a very limited part of the seed lots and fields (external quality control). This system may seem less efficient in terms of the guarantees that the government is able to give to the farmers, but it requires fewer government resources than the comprehensive regulatory system. By placing the responsibility on the producer and trader, a better appreciation of quality should develop. It should be accompanied, however, by increased government Extension promotion of seed to create a farmer market, and by specific legal responsibilities of the supplier to ensure the stated quality.

Government policy recognizes that planting value of seed depends on its quality; all activities shall make every effort to provide seed of maximum economically feasible quality. Government efforts must be focused on ensuring a stable supply of high-quality seed, while attracting private investment. All seed offered for sale should comply with all quality requirements, in all operations. Every seed producing entity must maintain its own internal quality control unit. Government should conduct realistic external quality control operations (Seed Law, Certification, service testing laboratories, etc.) required protecting both seed users and seed suppliers.

A realistic Seed Law is essential to ensure reliable standards of seed quality, protect seed users and suppliers, and develop a quality-oriented seed industry. Standards should not be inflexible. In emergency situations, and when the need arises, certain aspects of quality standards may be relaxed temporarily. Certification should be voluntary; seed that complies with Seed Law requirements may be freely sold.

6. INFORMAL SECTOR

What is the informal sector? The "informal seed sector" is not really a sector; it is more a term to describe the use of grain or unimproved seed as planting stock. The sector comprises all seed activities, which are not considered formal. Generally, the informal sector operates in areas, which are not served by the formal seed sector, as well as for crops for which no improved varieties exist. In such cases, farmers still need to plant seed; they may save their own seed or obtain the seed neighbors, local grain market, NGOs, etc. From a macro-economic point of view, this planting material is not the most cost-effective and its contribution to national food production is limited. In spite of the fact that in many marginal areas such seed may be the best option for the farmer, it is also often used because: (1) improved seed is not available; and/or (2) the farmer does not understand the benefits of improved seed.

In many developing countries there is strong resistance to supporting this informal seed sector, because the formal seed sector is much more effective in terms of rapid introduction of new varieties and widespread use of improved seed. Moreover, national and international variety development efforts are too costly to be used in the informal sector (few users are reached); only a formal seed sector will be able to make expensive new technologies widely available to farmers. Furthermore, support to the informal seed sector is often perceived as competition to the formal seed sector, and supporting the informal sector is detrimental to the development of a strong national formal seed sector. However, efforts in the informal seed sector should complement those of the formal seed industry and aim at areas where the formal seed sector does not reach or where the formal seed sector has nothing to offer. It is, furthermore, important to realize that the informal seed sector—if successful and properly supported—will gradually become part of the formal sector. Once we start supporting/developing the informal sector, it will develop and there will be a need for improved genetic material, quality, etc. In fact, in the majority of European countries the entire seed sector started informally, and developed into the current formal sector; the same will happen in developing countries. Therefore, support to the informal seed sector should ultimately lead to a strong formal seed sector and support to the informal seed sector is justified.

Although the National Seed Policy should emphasize the formal seed sector, the informal seed sector should not be neglected and governments should not discourage support to the sector. Furthermore, there is initially no need to strictly control the seed that is produced in this sector (quality control and certification). A participatory approach to plant breeding, as practiced by international centers such as ICARDA, should be supported, because it will assist the small-scale resource-poor farmers to raise production and standard of living. On the other hand, governments should help develop farmer quality-consciousness and understanding of the benefits of improved seed and genetic quality. They should encourage, where beneficial, the introduction of improved varieties from the formal sector into the informal sector. The Agricultural Extension Service should be strengthened and should strongly educate farmers in the benefits that improved seed can give to them. The 'seed message' should be more clearly included in all extension programs. Agricultural Extension staff themselves must be trained, able and willing to carry out this important role.

At the same time, government strategies should encourage the emergence of small private seed companies which will regularly supply these farming communities with quality seed of improved varieties and other essential inputs.

7. EMERGENCY AND DISASTER SEED RELIEF

Environmental conditions are quite erratic in the Near East and North Africa. Climatic variability, particularly variability in seasonal rainfall, can play havoc with crop production and lead to major breakdowns in food and feed supply. This is certainly the case in areas where rainfed agriculture is practiced. Apart from climatic vagaries of the region, national turmoil and regional conflicts (man-made disasters) often interrupt regular food and feed production. The combination of climatic variability and human conflict can often have catastrophic consequences, as witnessed recently in some areas.

Quality seed of improved varieties is an important agricultural input and unavailability of seed is one of the reasons why, under disaster situations, the normal cycle of food and feed production may collapse. Access to quality seed is important in ensuring the resilience of the production base, which provides the inherent capacity of a country to respond to, and mitigate the impacts of, a disaster. It is, however, remarkable that literature on national food security strategies generally does not elaborate on seed supply. Most important is that countries, certainly those prone to years of shortage of rainfall, are prepared for emergencies.

Emergency seed relief is not necessarily a part of a Seed Policy; rather, it is a part of other Government Policies. Immediate effects may be ameliorated by emergency seed relief, but is should be intended as a short-term remedy to production shortfalls and not become a long-term activity, interfering with developmental activities.

When emergency seed supplies are needed, Government Policy should be to seek first to purchase the needed seed from private sector producers and government distribution should not interfere with private enterprise marketing activities. This should also be the case if NGOs are assisting in emergency situations.

It should be kept in mind that free distribution of seed should be an emergency measure only and not continue after the cause has been removed. In many countries it has been shown that supplying free seed for longer periods, has a direct effect on farmers' willingness to pay for seed at the later stage.

One successful method is to issue certificates to disadvantaged farmers, which can be redeemed for seed at a private sector seed enterprise. Government then pays the enterprise for the value of the certificates for which he has supplied seed.

Preparedness is the key word. A major part of any strategy for increasing seed security is having information available, which will allow quick action in cases of emergency.

Information is required on:

- the number of households, the individual risk of becoming seed constrained, consumer preferences and other socio-economic data;
- the major crops and varieties in the farming systems;
- available (national and regional) seed stocks of regionally adapted varieties, potential seed producers and suppliers;
- plant quarantine measures: variety and seed registration regulations; seed import and trade regulations in effect in each country;
- Available seed security stocks (national and regional).

Data bases on the seed situation (including seed stocks) in each of the countries of the region, as well as a Geographic Information System in which various climatic and population information is linked with crops, and specific variety characteristics, are essential.

The strategy should also include:

- The initiation of national and regional seed security stocks (National carry-over seed stocks, Regional seed security reserves, Community-based seed banks, Strategic area seed reserves).

- Strengthening national seed industries in the region to ensure that seed is available in the region when disaster occurs, as well as to enable the production of quality seed for seed security stocks. This includes support to local seed supply systems, in particular improving local seed storage techniques, as an important strategy for improving household and community level seed security, *i.e.*, avoiding the need for emergency operations.

- Strengthening of regional cooperation. Cooperation can involve joint collection of data, linking of national security stocks, liberalization of movement of seed across borders and sharing of experiences with regard to disaster preparedness and emergency operations.

- Harmonization of national seed policies, rules and regulations, concerning plant variety protection, variety evaluation, quality control and certification, import and export, phytosanitary requirements, etc. Seed security strategies (in particular those where seed crosses national borders in emergency situations) can be seriously restricted by such laws and regulations.

- Regional variety evaluation and a regional variety catalogue.

8. HARMONIZATION AND LIBERALIZATION OF CERTAIN RULES AND REGULATIONS

Almost all country policies in the region are emphasizing the role of the private sector in the seed supply pipeline. The private seed sector in the NENA region is expected to take the lead. A private seed industry can, however, only successfully operate if it has access to the latest technology and if it can market its products in both a national and a regional market. National markets are often too small for profitable operation. To be able to have access to the latest technology and market products in a number of countries, liberalization and harmonization are important. A realistic approach to this is included in the World Bank Sub-Saharan Africa Seed Initiative (SSASI), which proposes eight 'best practices for seed regulations' in order to achieve effective participation of the private sector.

Market Entry: To ensure the emergence of domestic seed companies, as well as entry of foreign companies (regional and international), governments should allow companies to enter into the market based on simple criteria, without heavy requirements for investment (equipment) or specific conditions concerning trained staff, etc.

Introduction of New Varieties: To allow companies to move varieties regionally for testing and marketing, governments should allow companies and public institutes:

(a) to have access to varieties and germplasm from any source, and

(b) to introduce new varieties without waiting for official tests and approvals. Governments should allow voluntary variety registration. Compulsory registration, if at all, may be for a limited number of strategic crops. In any case 'registration' data from any source should be acceptable.

Seed Quality Control: Seed certification should be voluntary, because compulsory certification slows the introduction of new varieties. Voluntary certification also reduces seed cost to farmers, which is particularly important for low-overhead local companies producing low-value seeds of non-hybrid crops. Governments should enforce Truth-in-Labeling and spot-check seed that is sold in the market. Government should set minimum standards and offer seed quality control services (testing, certification) for free.

Seed Export and Import: To allow seed companies to produce seed volumes in countries of their choice and to move seed across borders to regional markets, Governments should allow companies:

(a) to import seed subject to realistic phytosanitary rules, tests, procedures only;

(b) to export seed without permits or quantity controls and with only those phytosanitary and quality tests determined by the importing country.

Retail Seed Sales: To allow development of marketing networks in low-volume seed markets, so that seed sales for small farmers are convenient, Governments should allow retailing of seed without registering with the Ministry of Agriculture.

Seed Producing Farmers: To allow competitive and efficient seed production, and to facilitate seed growing by small farmers, Governments should allow seed companies to contract seed production with farmers of their choice, without government registration, permission or screening.

Intellectual Property Rights: Governments should introduce legislation that allows breeders to register ownership of new varieties, but the sale of unregistered varieties should remain possible. Companies should have open and equal access to varieties developed by the public research. Public research should have a policy to sell germplasm.

Transgenic Plants: Laws and regulations should be established that allow: (a) sale of products from transgenic plants; (b) testing of transgenic plants; (c) introduction of transgenic plants; and (d) patenting of genes, etc.

Policies should emphasize the need for liberalization and regional harmonization of rules and regulations dealing with these aspects of the seed industry. New technologies can then be introduced rather quickly and varieties can move across borders without difficulty. Companies can sell seed in more than one country. This will attract private sector investment, as it allows an enterprise to produce enough seed to generate the profit required to pay costs and keep the business in operation.

9. CONCLUSION

Seed industries in several countries are still not sufficiently well developed in the Near East and North Africa region. An effective, up to date, realistic National Seed Policy, backed up by adequate strategies to adopt and implement the policy, will be able to improve the situation. Furthermore, it is important that government policies stress the importance of liberalization and regional harmonization.

Several governments have policies for the development of a sustainable seed industry, often with emphasis on the role of the private sector in production and supply of high-quality seed. However, adoption and implementation is lacking behind and realistic strategies are not really in place. The private sector does not (is not able to) play its full role in the production and supply of seed, certainly not for the important, often self-pollinating, food crops, because governments have not been able to create an environment in which the private sector can successfully operate (enabling environment). There is a need to implement policies, which support the private seed sector. Several seed rules and regulations must be liberalized and harmonized across countries of the region to speed up introduction new technologies and to make private seed supply more cost-effective.

Policies should not neglect the informal sector in those countries where this sector still plays a major role in provision of seed to farmers. Supporting the informal sector will ultimately lead to stronger formal seed sector.

10. REFERENCES

Anon. 1994. Harmonization of seed laws in SADC region: Report of a regional workshop, Harare, Zimbabwe. Commonwealth Secretariat, London, U.K.

Cromwell, E., S. Wiggins, and S. Wentzel. 1993. Sowing beyond the state; NGO's and seed supply in developing countries. ODI, London, U.K.

Douglas, J.E. 1985. Alternatives to strengthen the seed sector in developing countries. Paper Presented at the Pan American Seed Seminar CIAT. November 25-29, 1985

Douglas, J.E. 1980. Successful seed programs: A planning and management guide. Westview Press, Boulder, Colorado, USA.

FAO. 1993. Quality declared seed; Technical guidelines for standards and procedures, FAO Plant Production and Protection Paper No 117, FAO, Rome, Italy.

FAO. 1990. FAO Seed Review. FAO, Rome, Italy.

Hort af Ornaas, A. 1992. Security in African drylands: Research, development and Policy. Uppsala University.

Kelly, A.F. 1989. Seed planning and policy for agricultural production. Belhaven Press, London and New York.

Louwaars, N.P. 1995. Regional cooperation in seed security in the West Asia – North Africa region. Consultancy Report, ICARDA, Aleppo, Syria.

Gisselquist, D., and J. Srivastava. 1995. Easing barriers to movement of plant varieties for agricultural development. World Bank Discussion Paper No 367. World Bank, Washington DC, USA.

Seed Unit, ICARDA. 1998. Seed security assessment in the drought-prone areas of West Asia and North Africa. Study prepared for the Office of Foreign Disaster Assistance Bureau for Humanitarian Response, United States Agency for International Development, February 1998. ICARDA, Aleppo, Syria.

Tripp, R. 1997. New seed and old laws; Regulatory reform and diversification on national seed systems. Intermediate Technology Publication, 103/105 Southampton Row, London, U.K.

Van Gastel, A.J.G., G.R. Manners, and J. Wadsack. 1997. Privatization of the seed industry in the West Asia and North Africa region. ICARDA, Aleppo, Syria and GTZ, Eschborn, Germany.

Wignell, A.O. 1988. Report on the status of the development of the FAO "Quality Declared Seed" System. In: Seed Production in and for Mediterranean Countries edited by A.J.G. van Gastel and J.D. Hopkins, pp: 106 – 121. ICARDA, Aleppo, Syria.

ANNEX

A MODEL DEVELOPMENT-ORIENTED NATIONAL SEED POLICY

This Model Development-Oriented National Seed Policy was developed for the WANA (West Asia and North Africa) and ECOWAS (Economic Community of West African States) or WASDU (West Africa Seed Development Unit) regions.

Provisions:

Article 1: Objective
Article 2: Force
Article 3: Implementation
Article 4: Applicability
Article 5: Notices and Rules
Article 6: Integration
Article 7: Quality Orientation
Article 8: Infrastructure and Sectorial Participation
Article 9: Private Sector
Article 10: Government Support and Initiation
Article 11: Government Seed Supply
Article 12: Multinational and Domestic Private Sector
Article 13: Crop Research
Article 14: Seed Research
Article 15: Variety Development, Testing and Release
Article 16: Stock Seed Maintenance and Supply
Article 17: Control of Varieties and Variety Ownership
Article 18: Seed Quality Control
Article 19: Field and Seed Standards
Article 20: Certification
Article 21: Seed Law
Article 22: Seed Testing
Article 23: Standardizing Seed Testing
Article 24: Seed Production
Article 25: Seed Conditioning and Ginning
Article 26: Seed Distribution and Transport
Article 27: Seed Use/Need Data and Statistics
Article 28: Seed Marketing
Article 29: Seed Extension and Promotion
Article 30: Credit for Farmer Seed-Users
Article 31: Credit for the Seed Industry
Article 32: Special Promotional Benefits
Article 33: Training and Technology Application
Article 34: Coordination and Cooperation
Article 35: Import and/or Supply of Equipment and Supplies
Article 36: Seed Import
Article 37: Seed Export
Article 38: Policy Advisory and Updating

Article 1: Objective

1.1. Recognizing the critical role of improved seed as a cost-efficient higher-yielding production input to reduce crop losses and production costs, increase agricultural productivity and yields, and improve economic efficiency of farmers, the Government of ________________ (hereinafter termed

Copyrighted material

Government), acting under authority established by Law No. ____ of _________, herewith enacts this National Seed Policy of ______________ (hereinafter termed National Seed Policy).

1.2. Government recognizes that it has the responsibility, and herewith establishes its official policy accordingly, to achieve the following principles in support of agricultural and rural development and stable national food supply:

1.2.1. Government has the primary responsibility to ensure that adequate and timely supplies of high-yielding, high-quality seed of all crops are available to farmers at reasonable prices and appropriate times.

1.2.2. Government must play the lead support role, develop pilot operations, maintain public-service types of infrastructural and service support required to maintain efficient seed supply, create and demonstrate farmer demand for higher-yielding seed, and create an operating environment favorable for private-sector investment in seed supply.

1.2.3. To conserve Government funds and ensure maximum efficient service to farmers and consumers, Government shall encourage the private sector to conduct those seed supply operations suitable to private enterprise. The private sector shall be responsible for production, processing, distribution and marketing of seed for farmer planting.

Article 2: Force

2.1. This National Seed Policy shall be effective as of the date hereunder specified, shall have the force of Law as provided in Law No. ________ of _________, and all parts hereof shall continue in force indefinitely, until specifically modified by Ministerial Decree under provisions of this Policy and the said Law No. ____________ of _________.

Article 3: Implementation

3.1. To implement this National Seed Policy, Government shall, as of the date hereunder indicated, begin to establish and bring into effective operation the following activities, where such are not already in effect:

3.1.1. Establish and operate the "Seed Industry Development Office" or office of similar function with other appropriate name, within the Ministry of Agriculture. This Office shall provide direct support, guidance, and assistance to any and all private-sector agencies interested in, and/or participating in, any activity of the seed industry. It shall serve as a focal point for providing assistance available from other agencies, and in cooperating and coordinating activities and obtaining support for the private sector. It shall impartially assist in development of the private sector, equally assisting any agency which participates, or desires to participate, in any component of the seed industry and/or its supporting infrastructure. It shall also issue at reasonable intervals a Directory of the Seed Industry.

3.1.2. Modify and/or amend such laws, regulations, decrees and other official acts which provide special investment incentives, freedoms, and rights to agencies which invest in any other government-specified priority activities and/or export-oriented activities, so that such benefits are available to private-sector firms in the seed industry.

3.1.3. Actively seek to encourage, support and promote private-sector investment in the seed industry.

3.1.4. Cooperate with and support private-sector seed production, supply, export and other operations.

3.1.5. Establish, conduct and maintain those corollary and support components and activities of a public-support nature which are essential for efficient supply of improved seed. Such components and activities shall be organized in a manner appropriate for efficient operation, adequately funded, and operated in accordance with international standards and norms for such activities.

3.1.6. Ensure that no Law or regulation, in any area of activity or Government responsibility, interferes with, delays or hampers the production, supply, import or export, of high quality seed.

Article 4: Applicability

4.1. To maximize supply of higher-yielding seed to farmers, Government herewith establishes this stable, consistent, long-range National Seed Policy, and shall guide and conduct all future seed-related operations under the conditions established herein. All activities related to production and supply of seed, corollary and supporting operations thereto, and components thereof, conducted by Government agencies and/or the domestic and/or international private sector, conducted wholly or in part within the national territory, shall be governed by the provisions of this National Seed Policy.

This National Seed Policy shall guide the content, meaning and intent of all provisions of all Laws which affect activities relating to seed, including Laws on tax, duty, import/export, traffic control, etc. All Government officers at all levels shall, under the implementation of any Law (except plant quarantine) in no way delay, impede or interfere with the use or movement of seed for planting purposes, under penalty of severe action including dismissal.

Article 5: Notices and Rules

5.1. To ensure timeliness and effectiveness of applicability, the Minister of Agriculture shall, as deemed necessary and in the best interests of national agriculture, farmers and seed industry, issue modifications and rules under this national Seed Policy after due public notice in accordance with official procedures. Such rules and modifications shall become a part of this National Seed Policy and shall appropriately affect its implementation, but shall not change its long-term intent of support, development, improvement and encouragement.

Article 6: Integration

6.1. This National Seed Policy shall become a part of, and shall operate in support of, overall National Development Policy and National Agricultural Policy. However, as it is in the national interest to maximize private-sector seed supply, where the National and Agricultural Development Policies conflict in operational details of this aspect of private-sector participation, this National Seed Policy shall predominate, provided that ultimate goals of operations hereunder shall fit into the objectives of the National and Agricultural Development Policies.

Article 7: Quality Orientation

7.1. Government recognizes that planting value of seed depends on its quality, as measured by established quality-control procedures. The focus of all seed activities shall be to provide the highest-quality seed (including genetic, physical, physiological, and phytosanitary quality components) which is economically feasible. To ensure maximum benefits to farmers and consumers, all seed offered for sale shall comply with all applicable quality requirements, and all seed operations and activities shall make every effort to provide seed of maximum quality. It is expressly understood that quality standards are not inflexible, and that as the seed industry and its technology develop, standards shall be expected to rise in order to provide improved service to farmers. In emergency situations, certain aspects of quality standards which do not affect genetic quality may be relaxed temporarily.

Article 8: Infrastructure and Sectorial Participation

8.1. Government recognizes that a complex technical/industrial/economic infrastructure is required to maintain a continuing flow of high-yielding seed of improved crop varieties. Government shall make every effort to ensure that all essential infrastructural components are established and operated in the manner most beneficial to national agricultural and economic development. Participation of both Government and private sector are required to ensure efficient use of funds and national resources, while providing the most effective service to agriculture. It shall be the responsibility of each sector to conduct those essential activities in which it is most competent, in close coordination with other activities/components and participating agencies. In general, activities/components of a public-service nature which normally require some form of subsidization shall be conducted by Government and its subsidiary organizations. All activities/components of a commercial, market-responsive nature, and in which the private sector is willing to invest in such as manner as to serve efficiently all or part of such national needs, shall be the responsibility of the private sector, and Government shall ensure that its agencies do not generate competition to such private-sector operations.

Article 9: Private Sector

9.1. Government recognizes the important role of the private sector in certain aspects of seed supply, and in providing required seed at minimum Government expense and minimum cost to farmers. The private sector is expected to play a major role in seed supply, and Government shall provide all possible support, as specified herein or established hereunder.

Article 10: Government Support and Initiation

10.1. It is the responsibility of Government to establish pilot operations, initiate development, and ensure that essential activities/components are established and operated as required. As the private sector develops the capability to provide the needed activities and high-quality seed, Government agencies involved in such activities shall reduce their operations correspondingly, so as to avoid direct competition with the private sector while ensuring that all farmers who need such seed are properly supplied. To maximize participation by the private sector and thereby reduce government expenditures, Government shall provide the maximum support to the private sector permitted by applicable laws. Where necessary and as possible, Government shall actively seek to modify and/or amend appropriate laws and regulations in order to encourage maximum private-sector seed supply.

Article 11: Government Seed Supply

11.1. Government's first responsibility is to ensure that adequate stocks of high-quality seed of improved varieties are provided to farmers, to ensure production of the required food, feed and fiber. Government recognizes that seed production of some crops does not meet the criteria for investment by the private sector. Government organizations shall produce the amounts and kinds of such seed as are required to ensure that farmer needs are met, when such seed are not provided by the private sector. However, Government shall not competitively produce seed of any kind supplied by the private sector. As the private sector develops the capability to produce and supply seed of such additional crops as are required and is actively supplying such seed, involved Government agencies shall appropriately reduce or terminate their supply of such seed kinds, in order to prevent Government-subsidized competition and to conserve Government funds.

Article 12: Multinational and Domestic Private Sector

12.1. Multinational private-sector seed firms can benefit the seed industry with new genetic materials and technology in addition to seed supply, but sometimes do not supply specific local needs, which may be best-supplied by local domestic seed firms, including some crop seed of lower profit. For maximum technology development, operating and cost efficiency and supply of seed needs, both multinational and wholly-national seed firms shall be encouraged and supported equally.

Article 13: Crop Research

13.1. The base of seed supply is to give farmers improved materials developed by research, in a form which can improve their crop yields. As many aspects of crop research are non-profit public-service-type operations, it shall be the responsibility of appropriate Government agencies to conduct such research. However, some aspects of research directly support profit-generating seed supply operations, and certain private-sector firms can and may conduct such research to the benefit of the nation's agriculture. Any qualified private-sector agency shall be permitted, encouraged and supported in conducting such research. Research results and solutions developed by Government agencies shall be freely available to, and exchanged with, the private sector.

Article 14: Seed Research

14.1. Research in seed science, technology and industry are essential to improve and maintain quality and cost-efficiency. Government has the primary responsibility to ensure that such research is conducted, with primary focus not only on basic research but also on adapting basic research and developing solutions to fit local needs of seed development and supply. Private-sector firms which can conduct such research are also encouraged to do so. Research results and solutions developed by Government agencies shall be freely available to, and exchanged with, the private sector. Measures to improve coordination among various seed industry operations shall include established ongoing means of bringing together seed industry participants to identify needs for seed research and to exchange data.

Article 15: Variety Development, Testing and Release

15.1. To ensure release of superior materials as new varieties and hybrids are developed, it is essential to test them under conditions similar to those under which farmers will grow them. Such testing is a public-service activity, and shall be conducted by Government, in accordance with specified procedures and for a period of time adequate to ensure correct identification of improved lines.

15.2. Varieties/hybrids developed by the private sector may be included but are not required to be included, in Government-conducted trials and research, and shall be considered solely on their merits. Such varieties and hybrids which qualify shall be freely-included on any recommended or otherwise officially notified lists of crop varieties, and shall be eligible for Certification. As improved varieties are of benefit to farmers, no charge shall be levied against any private-sector breeder for including a specified number of materials in test trials.

Article 16: Stock Seed Maintenance and Supply

16.1. Maintenance and supply of stock (Breeder, Foundation, Registered, etc.) seed of improved varieties and hybrids is the responsibility of the agency which develops the variety/hybrid. Within Government breeding programs, a special agency shall be established with adequate staff/facilities/budgets to ensure timely supply of the required amounts and kinds of seed. Government-produced Foundation and/or other stock seed shall be freely allocated at reasonable cost to qualified private-sector agencies upon request, as and when it is available and in accordance with established requirements for variety control. Every effort shall be made to produce stock seed adequate to meet all appropriate requests. Private sector agencies may make advance requests to ensure allocation of such seed, through appropriate channels established therefor.

Article 17: Control of Varieties and Variety Ownership

17.1. Considerable expense is involved in developing an improved variety, even though the ultimate benefit derives to farmers and the national food supply. To encourage variety development research and permit recovery of development costs, appropriate laws and/or regulations shall be established to permit the breeder/developer to control seed production/ supply of his varieties so as to benefit financially from his development investment, while serving the needs of farmers and the nation's agriculture.

Article 18: Seed Quality Control

18.1. Adequate control of seed quality requires constant supervision, checking, inspection and testing. To ensure effective quality control, every seed program is encouraged and shall be assisted by Government to maintain its own internal quality control unit, operating in accordance with internationally-established procedures. In addition, Government shall appropriately maintain and conduct those external quality control operations (*e.g.*, Seed Law, Certification, service testing laboratories, etc.) required to protect both seed users and seed suppliers.

Article 19: Field and Seed Standards

19.1. To ensure high seed quality and operating cost-efficiency, quality control of both seed fields and seed lots is necessary. Standards for different categories of seed production fields and seed lots shall be established, to the extent possible in compliance with international norms, but in all cases achieving a balance between the needs of farmers for high quality *vs.* realistic production capabilities under current agro-economic conditions. It is recognized that standards are flexible and can be improved as technological, operational, and infrastructural developments permit; when emergency conditions require, standards which do not affect genetic quality can be lowered temporarily.

Article 20: Certification

20.1. As a means of helping develop a quality-oriented seed industry and achieving high seed quality, functionally-independent seed Certification shall be developed, and all seed agencies encouraged to participate to the fullest extent. Certification, in standards, procedures, concept and methodology, shall comply with internationally-recognized norms.

20.2. While Certification of all seed produced and marketed is recommended, it shall not be compulsory. Seed which complies with Seed Law requirements may be freely sold without Certification. Further, disclosure of parentage of proprietary varieties/hybrids shall not be required in order to enter them into Certification.

Article 21: Seed Law

21.1. A realistic Seed Law which reflects current requirements, constraints and capabilities is essential to ensure reliable standards of seed quality, protect seed users and suppliers, and develop a quality-oriented seed industry. Government shall seek to establish and maintain current a Seed Law which reflects policy and overall measures in the long-term, with day-to-day and operating details established through Ministerial Decrees. An adequately equipped/staffed/ funded implementation agency shall be maintained, and all seed offered for sale shall be subject to requirements of the Seed Law. Under the Seed Law, a regular sampling and testing program shall be conducted.

Article 22: Seed Testing

22.1. Rapid, reliable and accurate tests of seed quality are essential to the conduct of the seed industry. Government shall establish and maintain a network of official seed testing laboratories in locations adequate to permit samples to be delivered to a lab within 24 hours after sampling, physical tests completed and germination testing begun within 24 hours after the lab receives the sample, and test results to be reported within 24 hours after completion of the germination test. These labs shall be adequately equipped and staffed with trained qualified analysts, and all operations conducted in full compliance with recommendations of the International Seed Testing Association (ISTA).

22.2. Each seed program, public or private sector, shall be encouraged and assisted in establishing and maintaining an adequate testing laboratory in accordance with international standards, as part of its internal quality control program.

Article 23: Standardizing Seed Testing

23.1. Reliable, repeatable seed testing results are essential for orderly seed supply and development of the private sector and seed export/import. To ensure standardized procedures and repeatable test results, a national referee seed testing and analyst training program will be established and maintained by Government as a public service.

Article 24: Seed Production

24.1. Seed production shall be organized and conducted to achieve the highest seed quality and operating cost-efficiency, recognizing that the objective of seed supply is not to build programs but to supply higher-yielding seed to farmers. The private sector shall be encouraged and supported to produce the maximum possible part of seed required for farmer use. Government shall produce only those seed kinds which are required but not supplied by the private sector. As much as possible, Government seed production shall be under contract with private farmers who shall be paid, guided, supported and supervised in a manner which helps them develop financially, in use of technology, and in their ability to organize and apply improved seed and crop production technology and to become self-sustaining private-sector seed operations.

Article 25: Seed Conditioning and Ginning

25.1. As an essential seed supply operation, conditioning shall be developed in such a manner as to provide the needed services most efficiently for the seed supply system and seed-using farmers. A national strategy shall be developed and followed to ensure that conditioning is established and conducted so as to provide the best service. Conditioning facilities and operations shall be complete, adequate, cost- and time-efficient, coordinated with handling/ receiving/storage, and conducted so as to obtain maximum benefit from its capability to improve seed quality. All seed agencies, Government or private sector, shall be encouraged and assisted to develop and maintain their own up-to-date, efficient seed conditioning facilities. Government, to the maximum extent possible, shall provide conditioning services to small or new seed operations on a fee basis, to assist in developing the seed industry. Government shall establish concessional credit and import systems to help estahlish and maintain up-to-date adequate conditioning facilities.

Article 26: Seed Distribution and Transport

26.1. Government shall encourage and support the establishment and operation of a distribution system, and separate individual distribution systems and networks, which make higher-yielding seed available to all possible farmers in all crop production areas, within their zone of mobility. To the maximum extent possible, private-sector merchants shall be utilized in the distribution system. Government shall make available at no cost, designs for safe seed storages of different capacity, suitable for different levels of the distribution system. Government shall also make available at no cost, designs for safe seed transport vans and vehicles.

Article 27: Seed Use/Need Data and Statistics

27.1. Correct, detailed up-to-date data on seed use and planned needs are needed by seed suppliers to plan production and distribution: seed-using farmers also need such information on seed availability. Government shall establish and maintain a system to collect and disseminate such information on a current timely basis, so that it can support management and decision-making by seed suppliers and users. Government shall also support and encourage development of management information and data systems suitable for use by seed programs/ firms to improve their management and operating efficiency.

Article 28: Seed Marketing

28.1. Marketing, as the means of promoting farmer acceptance and use of higher-yielding seed, is encouraged and Government shall do its utmost to support and coordinate honest, effective and intensive marketing efforts in both government and private sectors. This shall include, but not be limited to, assistance in marketing campaigns, developing promotional methods and materials, emphasizing seed in agricultural extension and farmer training programs, etc.

Article 29: Seed Extension and Promotion

29.1. As a primary means of educating farmers in acceptance and use of improved technologies, extension promotion of higher-yielding varieties and seed shall be developed, promoted and maintained by Government to the maximum extent. Such promotion shall include improved seed and varieties without regard to origin or supplier.

Article 30: Credit for Farmer Seed-Users

30.1. Government shall establish and maintain crop production credit for farmers which includes credit for purchase of higher-yielding seed. Such credit shall permit the farmer to select the supplier from whom he buys his seed, without distinction between government and/or private-sector suppliers.

Article 31: Credit for the Seed Industry

31.1. Government shall ensure availability of credit for seed industry firms, at concessional rates which promote investment in seed supply. Such credit shall be available for financing capital expenditures, operating expenses, and seed inventories. Collateral requirements shall be minimized.

Article 32: Special Promotional Benefits

32.1. In order to encourage private-sector seed supply, private-sector agencies which invest in a specified manner in seed supply activities shall be eligible to receive such incentives as tax exemptions, import and export privileges, special-rate loans and financing, guaranteed repatriation of profit, etc., as are offered by any government agency and/or law, to promote investment in any identified priority area.

Article 33: Training and Technology Application

33.1. Production and supply of higher-yielding seed requires practical application of high technology in all activities, under farmer conditions. Development, transfer, application, and training in appropriate up-to-date technology shall be actively supported and pursued by Government. Such improved technology shall be freely available to any government or private-sector agency involved in the seed industry. Such technology shall include but not be limited to research developments, training courses, conferences, meetings, publications, bulletins, manuals, etc. Any private-sector seed industry firm shall be equally eligible for its staff to participate in any Government-conducted or sponsored seed-related training program, and shall have free access to seed- and crop-related training, publications, data, etc., developed by Government agencies. Private-sector seed agencies shall have unrestricted eligibility to hire Government seed personnel and specialists. All Government agencies which participate in such activities and/or have the technical competence to provide any required support and assistance, shall provide all possible technical support and assistance to any Government and/or private-sector seed industry agency which has need of such support.

Copyrighted material

Article 34: Coordination and Cooperation

34.1. To ensure efficient operation and minimize the required investment and use of national resources, Government shall ensure that Government and private-sector agencies cooperate and work toward the common goal of improved agricultural efficiency, and that competition to the private sector in specific activities shall not be generated by Government organizations. Such coordination shall include, but not be limited to, regular seed industry conferences, newsletters, bi-sectorial advisory committees, regular exchange of information, training programs, seed trade and/or technical associations, etc.

Article 35: Import and/or Supply of Equipment and Supplies

35.1. It is recognized that it is most efficient to import certain equipment and supplies required by seed operations. Government shall minimize or eliminate tax, duty and/or restrictions on such essential imports, and shall expedite procedures so that such commodities may be quickly and economically imported. Any other restrictions, such as re-export of such commodities, shall also be waived in order to promote efficient seed supply.

35.2. When domestic manufacture and supply of such equipment and supplies is possible and economic in the service of the national seed industry and possible export, Government shall encourage and support to the maximum extent such domestic manufacture and supply, and establishment of joint ventures, licensing agreements, etc. Provided that, such manufacture and supply shall be in compliance with internationally-recognized procedures for protection of patents, copyrights and other applicable forms of intellectual property rights, so that the nation's standing in the international community shall be maintained at a high and respected level.

Article 36: Seed Import

36.1. From time-to-time, stock seed must be imported for research and development purposes which are ultimately in the best interests of national agriculture. Import of some seed, at some times, for use by farmers is also in the national interest. All possible Government assistance shall be provided to any Government or private-sector agency which requests import clearance of such seed, within procedures specified in appropriate regulations established hereunder. Administrative procedures required shall be minimized so delays do not occur. Only normally-applied seed quality standards and internationally-recognized plant quarantine standards shall be required. All possible assistance in expediting shipment, clearances, currency exchange, letters of credit, etc., shall be provided so as to expedite movement. The "Seed Industry Development Office" established under provisions of this National Seed Policy, shall serve as a focal point of support and assistance.

Article 37: Seed Export

37.1. Local climate and agro-economic conditions are, or may be found to be, ideally suited to produce high-quality seed of some special and/or labor-intensive crops. Production of such seed for export, either in excess of domestic needs or specifically for export, increases farmer income and supports national economic policy, exports farm labor, and earns foreign exchange. Government shall provide to domestic and multinational private-sector agencies producing seed for export, all officially-provided incentives and supports available to other promoted and/or export-oriented activities. Administrative procedures required shall be minimized so delays do not occur. Only normally-required seed quality standards and internationally-recognized plant quarantine standards shall be required. All possible assistance in expediting shipment, clearances, currency exchange, letters of credit, etc., shall be provided so as to expedite movement. The "Seed Industry Development Office" established under provisions of this National Seed Policy shall serve as a focal point of support and assistance.

Article 38: Policy Advisory and Updating

38.1. To keep this National Seed Policy current and applicable to changing conditions, a National Seed Advisory Committee shall be established, with membership from representative agencies of both Government and the private sector. This Committee shall meet regularly, deliberate on all factors affecting seed supply and use, and advise the Minister directly on policy modifications needed to keep policy current and supportive. The Minister shall consider such recommendations, discuss them as appropriate, and in accordance with applicable laws, issue modifications in the National Seed Policy to improve its suitability and applicability to current conditions without changing its long-term intent and validity.

ISSUED this ______ day of ________, 19___.

____
MINISTER OF AGRICULTURE

PRIVATISATION OF THE SEED SECTOR IN THE NEAR EAST AND NORTH AFRICA

Michael TURNER; Sam KUGBEI; and Zewdie BISHAW
Seed Unit, ICARDA, Aleppo, Syria.

1. INTRODUCTION

Efforts to improve the seed supply in developing countries have been in progress since the early 1970s, mostly through medium of projects financed by international agencies or bilateral aid agreements. These projects put in place the essential components of a national seed program such as processing, storage and quality control facilities. They also provided training in the associated technical procedures such as seed testing and certification.

Because of the nature of development assistance, these projects were invariably implemented through government agencies, either directly with Ministries of Agriculture or by parastatal seed corporations. This practice was entirely consistent with the policies of the time, which, in most developing countries, saw the Government playing a dominant role in social and economic development. Seeds were often regarded as a strategic input to agriculture and therefore naturally the concern of Government. At the same time, the private sector showed little interest in this business and in some countries was actively discouraged.

It was in this climate that many national seed organisations became established. They were generally run in a bureaucratic way to fulfil official planning objectives, with little concern for managerial or financial efficiency. They were also strongly production-oriented while marketing was neglected. National seed organisations were closely linked to extension programs and input credit packages in which the real cost of the seed was not charged and the real value to farmers not tested. If production exceeded requirements, the unsold seed could be easily diverted to the grain market and the government ultimately covered the losses incurred. On the other hand, if there was a shortage, the Government tried to arrange for importation, often from uncertain sources.

This pattern of development was observed in many developing countries, including those of the Near East and North Africa (NENA) region, which is the immediate concern of this paper. As a result, the first seed organisations established were generally large, monolithic institutions, closely tied to government policy and therefore lacking managerial flexibility. They had large numbers of staff, often well trained at the higher levels, but some key managerial procedures, particularly relating to planning, marketing and stock control were generally weak. A further complication was that these initial seed projects often combined the production and regulatory functions under one entity so that there was no independent quality control agency in the country.

This paper briefly outlines the recent developments, which have raised the profile of privatisation in national seed programmes, and explains the mechanisms by which this process can be advanced. It then considers a number of issues, which may affect the implementation of privatisation policies, and the likely consequences of privatisation on the overall seed supply system and the farming community, which it serves. The paper draws on the general experience of many developing countries and interprets this in the specific context of the Near East and North Africa.

2. CHARACTERISTICS OF THE NENA REGION

It is appropriate to consider the characteristics of this region, which may influence the development of national seed programmes and the prospects for privatisation. Two types of factors may be identified; first, those which relate generally to the agriculture and crops of the region, and second, those that are determined by the political and economic circumstances of individual countries.

The typical agro-ecology of the region is one of low total rainfall, which occurs almost entirely during the cool winter, while the summer is hot and dry. Therefore, only one crop can be grown per year under rainfed conditions, and that crop is often subject to risk due to variation in the timing and quantity of rainfall. Supplementary irrigation to guarantee the success of that crop is extremely beneficial if it can be provided. The traditional crops of the region are those that are naturally adapted to this seasonal pattern, namely wheat (bread and durum), barley, lentil, chickpea and faba bean.

Where sufficient water is available for irrigation throughout the year, a summer crop can also be grown, which is most commonly cotton, rice, maize or sunflower. Because of the large livestock population, fodder/forage crops play an important part in all production systems in the region; typically they are barley, oats and a range of legume species, depending on the availability of water and the local pattern of livestock management. Vegetable production is practised everywhere under irrigated conditions and sometimes in protected environments.

The region is not characterised by subsistence farming; and most producers are connected to the cash economy to a greater or lesser extent. Indeed, even in some areas when yields are low, the mechanised harvesting of crops by contractors is a well-established practice. There is a close relationship between crop and livestock production so that straw and stubble make up an important part of animal feed during the dry season. Likewise, the intensive production of fodder under irrigation for cash sale is a very active business in some countries.

Another feature of the region, which should be noted, is the importance of natural resource management. As a result of the dry environment, which in many areas cannot support crop production, raising of livestock, especially small ruminants, is an important part of the total agricultural output. Increasing livestock numbers have placed the environment under severe pressure and raised concerns about sustainability. Consequently, there is an interest in the introduction of improved management practices for natural and managed pastures. However, a secure seed supply is a common constraint in these efforts, both at the development stage and in the wider implementation of successful strategies. This is a topic in which ICARDA has had an active interest for many years and seed supply continues to be a recurrent issue in livestock management programs.

Due to political differences in the region, the economic picture is diverse. Similar to situations in much of the developing world, in the past, most countries had relatively controlled economies, often with strongly socialist policies. That has been changing in recent years, notably in Egypt, Turkey and Morocco, but in some other countries there remains a strong government presence in the traditional industries and services even though an active private sector is engaged in manufacturing and small business. Despite substantial oil revenues in some countries, the region is not characterised by vibrant economic growth. This is due in part to the many political tensions that exist. For political and/or economic reasons also, some countries are strongly supported by external donors while others are relatively isolated from that system. In general, one could say that the region is not as advanced in the process of economic liberalisation as are some other parts of the world. The region is also less dependent on foreign assistance. On the other hand, proximity to Europe and concerns about political and social stability may lead the European Union to maintain strong economic support to those countries in the Mediterranean region.

3. THE CHANGING ECONOMIC CLIMATE IN DEVELOPMENT

From about the mid-1980s, the climate of development began to change. In some countries, particularly in Africa, formal 'structural adjustment' programs were implemented to reduce the oversized public sector and to promote private initiatives. This was linked to the removal of price controls so that producers could sell in a free market; that was seen as a key step in promoting agriculture and increasing national food production. The philosophical basis of this move was that the efficiency and creativity associated with the private sector could not be realised while the Government occupied such a dominant place in the economy. However, it is also true that in many cases the government budget simply could not support the wide range of activities and responsibilities it had acquired. In the countries of the Near East and North Africa, structural adjustment was not a notable feature. In some countries, the same process of economic liberalisation began and was supported by foreign donors.

In the specific context of seeds, these policy changes naturally prompted a reappraisal of governments roles in seed supply and calls from development agencies for a progressive withdrawal from a direct role in production, thus allowing the private sector to take over the more commercial functions of production and marketing. The Government was expected to concentrate on creating a policy environment more favourable to the development of a more diverse seed supply system. The Government would of course retain responsibility for regulatory matters, but with the clear expectation that regulations would be consistent with a more liberal seed policy and not obstruct the entry of new participants in the seed industry, whatever their origins.

These changes became branded with the general title of 'privatisation' a term that carries some connotations from elsewhere which may be misleading. It may be more appropriate to regard the process as one of 'diversification. That is the shift from one major supplier with a national remit to many different suppliers operating in selected crops or locations in which they could develop a viable business

4. MECHANISMS OF PRIVATISATION

There are several possible mechanisms by which the seed sector can be privatised or diversified, as summarised below:

(i) Transfer of ownership: The simplest approach is for existing government enterprises to be transferred to private ownership. This can be done through the creation and public offer of shares or by selling to an existing company or through a 'management buy-out'. All of these mechanisms have been widely used in many countries in the privatisation of state enterprises, such as public utilities (Klenk, J. et al., 1995). This process began in the UK early in the 1980s and continues to spread around the world as Governments attempt to reduce their financial and management commitments, and raise a large amount of cash through the sale of state assets. Unfortunately, the outright disposal of seed organisations in this way is very difficult for a number of reasons. Seed organisations are generally over-capitalised, over-staffed, managerially complex and, most important, they seldom have a truly profitable product portfolio. While it is possible to offer inducements to buyers and to plan a phased transfer, this is a difficult road to follow. One example of this approach is the recent establishment of a commercial seed company designed to take over all the production operations of the National Seed Administration in Sudan. However, this company has substantial development investment and it is presently too early to assess its progress in commercial terms.

(ii) Restructuring existing units: An alternative approach is the gradual restructuring of existing government units to operate along more commercial lines so that they become viable enterprises with more managerial autonomy. They could eventually be sold off or continue to operate as suppliers of public sector varieties without direct subsidies which do not enable them to compete fairly with the true private sector. This approach is particularly suited to countries where there are a number of seed processing centres of medium size serving a limited geographical area. They can be made into autonomous units first, which is a more manageable process because the problems that arise can be addressed progressively. This approach is being implemented in Egypt through the GTZ project entitled " Improvement and Decentralisation of Governmental Seed Production and Marketing."

(iii) Encouraging new entrants: The pursuit of diversification by encouraging new seed enterprises to enter the market requires policy changes, which must remove regulatory impediments and create an open market free from price controls or other marketing restrictions. This enables companies to charge the full cost of their operations and to make a profit, without the fear of unfair competition from the public sector. This approach is complementary to the 'restructuring' approach mentioned above because the new entrants may be assured success by the ongoing changes in the public sector. Of course, the new entrants will enter the market cautiously and selectively, focussing on the more profitable crops and the most productive agricultural areas first.

(iv) Leasing public facilities: One other approach, which has been practised in some countries, is the leasing of existing government facilities to private companies. This may apply particularly to seed processing plants, which often operate well below their capacity, especially if the government program is the contracting agency. Plant can therefore be leased on a weekly or monthly basis to private companies. This approach allows companies to make good use of past investments. However, it may present management problems and it is probably only a transient solution until companies have sufficient confidence or resources to acquire their own facilities.

It is clear that there are various measures, which can lead to a diverse and financially viable seed industry. These approaches are not mutually exclusive. The outright transfer of existing assets may be the least promising for reasons already stated. The most attractive formula is the simultaneous restructuring of government and parastatal seed organisations to remove direct subsidies while providing encouragement to the emerging private sector through appropriate policy changes. However, there remains the question of how to test the real interest and commitment of the private sector, while the state is still the predominant player.

5. HOW TO PROMOTE PRIVATISATION

We may make the assumption that most countries of the region would express general support for the role of the private sector in their seed industry, although there are a few exceptions. Certainly those that seek foreign assistance are more likely to respond to pressure and open up the seed sector. We may then ask how this process can be assisted? There are two parallel approaches, first to remove all the official obstacles to the private sector participation and, second, to provide active encouragement. Obstacles that may need to be removed include restrictive procedures such as difficulty in obtaining basic seed of public varieties or in importing foreign varieties and delays in the certification of crops or seed lots. In addition, there are general issues related to price controls and subsidies, which have already been mentioned.

Equally important, but less tangible is the confidence among the private companies that its contribution to seed supply is recognised and 'appreciated' by the government. This is not simply a matter of instituting official procedures, but more a question of trust and access to senior people in the Ministry and can of course quickly change depending on the attitude of a few key individuals. We know that within Ministries there can be tension between those promoting reform and more conservative measures. This can apply to seed policy just as it does to matters of the national economy. There are also instances where the implementation of new procedures by middle ranking Ministry officials is not consistent with the declared policies of the Government. There may be due to conflict of interests and a desire to maintain the status quo. For example, institutions may try to retain existing work and staff. Of course, we understand why that occurs – self-preservation is a strong instinct, both for an individual or an institution.

Providing active support to the private sector may be problematic because the Government may find it difficult to reduce a subsidy to its own operations while offering direct assistance to private companies. However, there are however concessionary arrangements such as low interest loans for business start-up or expansion and tax holidays for new businesses. The risk always with such schemes is that they can be exploited by those who are already well-established in business rather than benefiting those who have a real short-term need.

Copyrighted material

Another indirect measure to support the private sector is giving access to an efficient quality control/assurance service. Establishing a seed testing laboratory and finding qualified staff can be a major problem for a new company. Therefore, the use an official laboratory and guidance on quality-related procedures can be a real benefit. However, this requires an open-minded attitude by the seed testing/certification agency, which was dedicated to official work in the past. These agencies may also need to adopt a more educational and supportive role towards the emerging private sector by providing assistance such as training. In contrast, in the past their role was primarily that of a policeman.

Ultimately, the progress of privatisation ultimately depends on the market, which when truly free, provides a robust test of financial sustainability. If the product offered is not sufficiently attractive to the farmers, they will not buy it and seed demand will remain limited. If circumstances change, such as output prices for agricultural products increase or new improved varieties become more available, then demand for seed may increase. It may be true that privatisation policies can create an 'enabling environment', but they cannot guarantee a certain market share or seed replacement rate, which was the case under the more managed supply system of the past.

6. IMPACT OF THE CROP PORTFOLIO ON PRIVATISATION PROSPECTS

We know that crops vary greatly in their potential for profitable seed marketing. Factors favouring seed marketing include low sowing rate, production under high-input conditions, high output value of the crop and technical complexity in the seed production process. Conversely, attributes such as low-output value, high sowing rates, unspecialised seed production practices and extensive low-input production systems are unfavourable to seed marketing. At one extreme there are hybrid vegetables such as tomato and pepper and at the other there are grain legumes and barley. Horticultural crops, which are already in the private sector domain, fall outside the scope of this paper; only cereals, legumes and forages will be considered.

Traditional field crops of the region offer limited possibilities for commercialisation of the seed supply because they are mostly self-pollinated cereals and legumes, or forages. Climatic factors, which affect rainfed crop production, are a further constraint to regular seed sale/purchase since investment in inputs may be a complete loss in the event of crop failure. Likewise, favourable climatic conditions at harvest enable farmers to store their own seed successfully from one season to the next without serious loss of quality. Only the irrigated summer crops such as maize and sunflower regularly attract private sector interest. However, they are only grown in limited areas. Cotton is a crop in which the private sector takes an active interest, for example in India and Pakistan, but in the NENA region there is usually a strong government involvement in all aspects of cotton production and marketing, including in the seed supply. Of course, areas of intensive irrigated crop production such as the Nile Delta are intrinsically more favourable to commercial seed supply because farmers are buying other input and are well connected to the cash economy.

While we all understand the technical basis of these differences between crops, the implications for privatisation are rather serious. For example, national research services may be under pressure to make their material available to the private sector, which is a very desirable move. However, it may also mean that the government seed organisations are left with only the 'residual' unprofitable crops, which do not provide a viable crop portfolio. This raises a rather difficult question – " If governmental seed organisations must continue in business to supply the unprofitable crops - should they be allowed to handle the profitable ones as well so as to improve their commercial prospects?" Are they able to maintain diversity in order to secure their income?

7. THE ROLE OF PUBLIC RESEARCH

There is much evidence that the main reason that farmers buy seed of self-pollinating crops is for variety replacement (Jaffee and Srivastava, 1992; Heisey, 1990). Therefore the availability of a steady flow of new material from research into agriculture can greatly improve prospects for a profitable seed business. This has been the experience in Europe and other countries, which have benefited from a highly competitive plant breeding sector following the introduction of Plant Variety Protection. Even with the stringent requirements for variety registration, there are still new varieties coming on to the market every year that stimulate great interest among farmers. In general, we can say that there is a strong link between the productivity of plant breeding research and the success of the commercial seed industry.

When considering privatisation we therefore have to look at the dynamics of varieties in the market, which are affected by two factors. First there is the absolute productivity of the public sector research programs - how many varieties are being produced? Second, there is the effect of the variety assessment/registration system, which in some countries is still very lengthy and restrictive. It is unrealistic to expect a dynamic private sector to emerge under circumstances where there are only a few crop varieties, most of which are old and well-known to the farmers. Companies may also look for promising varieties to introduce from overseas, but still the registration system may delay actual commercialisation. This can have a very negative effect on the private sector.

This issue is fundamental to the liberalisation of the seed sector. In the past, governments were content if there were a few reliable varieties from national research stations cultivated in most of the area for the main crops. With liberalisation, one would expect to see much greater diversity in varieties, and since there is much breeding work in progress in the world, it would be unlikely that varieties from one source would dominate the market. However, the Agricultural Research Services may see their position as vulnerable in the face of open market competition and may seek to retain a major influence on variety release. While their position may be viewed as defensive, their concerns may be legitimate. The public sector may have the responsibility to breed for all environments, whereas the private sector could concentrate on areas of high potential within which it can achieve regular seed sales.

Another relevant variety issue is that of specific versus general adaptation. Multi-locational testing systems tend to favour widely adapted varieties and commercial companies also prefer those varieties, which can be marketed to a large area. On the other hand, in more difficult environments, varieties with specific adaptation may be required. The varieties will not be favoured by the private sector and therefore so public breeders will have to maintain an interest in environmentally difficult areas, possibly using participatory approaches and farmers involvement in variety selection.

A further issue, which may arise as the private sector develops, is the procedure by which public sector varieties are made available for use by private companies. Should there be open access to all companies, or limited release, or even exclusive release, which may offer better prospects for effective commercialisation? These are clearly very sensitive issues for an emerging private sector.

8. THE IMPACT OF PLANT VARIETY PROTECTION (PVP)

Before leaving the question of plant breeding and varieties, it is appropriate to consider the possible impact of PVP legislation, which may be introduced in several countries of the region within the next year or two. In principle, such legislation is intended to stimulate private sector breeding by enabling breeders to collect a royalty on the use of their varieties. This has been an extremely effective stimulus to competitive plant breeding in Europe in the past 30 years. However, there is reason to be cautious about the effect of such legislation in the countries of this region, at least as far as non-hybrid field crops are concerned. Investment in plant breeding is a long-term process and returns depend not only on having the 'rights' for a variety but also on the effectiveness of the royalty collection system. Given the high percentage of farm-saved seed and the sensitivity to price, it seems unlikely that the availability of variety protection would provide sufficient incentive to promote substantial investment by the local private sector. However, PVP be useful for imported varieties of outstanding merit and certainly for some perennial crops such as tree fruits in which the propagation system can be controlled better.

9. ROLE OF MULTI-NATIONAL COMPANIES

One dimension of privatisation, which arouses interest in many quarters, is the role of multi-national companies. Indeed, some believe that privatisation will lead to a major penetration of the market by such companies. In reality, these companies continue to consolidate and to dominate some sectors of the seed industry, but as already explained, they are highly selective. They operate only in the most profitable crops and in areas where they expect to recover sufficient profits from the regular sale of hybrid seeds to justify their investment. Therefore, they may contribute to increasing productivity in the high potential areas, and that may significantly improve national production, but they may have no impact at all on marginal crops and low potential areas. If this is accepted, it provides the fundamental justification for the continued investment in breeding for the 'public good' by the IARCs and NARS.

The extent of investment and commitment by such companies can vary widely. They may engage in a breeding program 'to meet local needs' while in reality they concentrate on costly research efforts in a small number of locations around the world. Therefore national subsidiaries and agents of multi-national companies will more likely be involved in the evaluation and marketing of varieties developed elsewhere. The question of whether the company carries out local production, or only import seed, is also sensitive. This will depend on a number of factors including production costs, local climatic conditions, management capabilities and the size of the market. For the higher value seeds, there is probably a tendency, as with the research effort, to concentrate production in a few well-managed locations and then to distribute regionally from the areas.

From a host country perspective, multi-national companies offer a source of high quality varieties and rapid improvement. However, there are also concerns that their entry may jeopardise local breeding efforts, which are less well-resourced. Furthermore, changes in the market or in the global strategy may cause these companies to leave a country if the market is no longer profitable, which may create a gap in the supply. As already noted, the existence of plant variety protection may encourage international companies to enter a market, while lengthy variety testing and release procedures have the reverse effect.

10. THE ROLE OF SMALL SEED ENTERPRISES

One of the problems faced by the governmental and parastatal seed corporations was their relatively large size. This was a consequence of their project origins, which normally favoured large capital investment, particularly in processing plants. Consequently, by serving a large area, the transport costs of raw seed these plants from growers and of clean seed out to farmers become very high. This adds to the total production cost and presents a serious burden if privatisation is considered.

These problems of scale prompt consideration of small seed enterprises as a more effective way of meeting local seed demand. They may also cope with local variety preferences in a way that a national organisation could never achieve. The problem with small seed enterprises is the lack of information on and experience in running these activities in developing countries. The Seed Unit at ICARDA has taken a special interest in this topic; we organised a workshop in 1998 to gather experience and discuss the issues, which arise in the establishment and management of such enterprises.

11. THE ROLE OF NON-GOVERNMENTAL ORGANISATIONS

In some countries, notably in Sub-Saharan Africa, international NGOs have played a significant role in the seed supply. This usually follows relief interventions during times of emergency as a result of natural disasters or civil conflict (Cromwell et al., 1993). NGO activities are typically community-based and may have strong interest in local issues such as the conservation of genetic resources and participatory crop improvement. Their contribution to the privatisation process may be positive or negative, depending on their production and pricing strategies. In the Near East and North Africa, NGO activities have not generally played a significant role in seed supply. This is probably due to a different political climate, which does not encourage such uncontrolled interventions.

12. THE IMPORTANCE OF A NATIONAL SEED POLICY

When government agencies were the dominant players in the seed system, seed policy was essentially an internal business of the Ministry of Agriculture and could, within reason, do as it wished. Since main activities were under its control, the Ministry of Agriculture did not have to define or declare a policy. With the prospect of more diverse seed industries emerging, policies assume much greater importance because they may, or should, define the spheres of activity of the participants. In fact, the existence of a policy may be considered a pre-requisite for diversification, since new entrants need reassurance that activities and responsibilities are well-defined and not subject to sudden change for political reasons. Therefore, if a Government is planning a new policy, there are benefits in publishing this as a written document. A classic example of this was the 'New Seed Policy' published in India in 1989, which aroused a lot of controversy at the time but which dramatically changed the face of the Indian seed industry in just a few years (Turner, 1994).

The importance of stability in the seed policy cannot be over-emphasised since it is fundamental to the issue of confidence. The private sector may be reluctant to become involved if it fears, on the basis of past experience, that the government may intervene without consultation. The most likely intervention is the distribution of cheap (or even free) seed for reasons of emergency relief or sometimes for political advantage.

13. THE NEED FOR REGULATORY REFORM

One major aspect of policy is the reform of seed legislation and regulations. In many countries, these regulations were devised in the 1970's often as project activities and they were tailored to serve the needs of government system. That is now often unsuited to the needs of a more diverse seed industry and may be a deterrent to the participation of new companies. This subject has been comprehensively reviewed by Tripp (1997). The revision of legislation and regulations should also be viewed in a regional context since it would be extremely beneficial to achieve some harmonisation. This is mentioned again in section 16 below.

14. THE NEED FOR A NATIONAL REPRESENTATIVE FORUM

Diversification of the seed industry through privatisation creates a strong need and justification for a national representative body in the seed sector. In fact, the concept of an 'apex body' such as a National Seed Council is already well-known and these councils exist in many countries already. However, it is common to find that these bodies are partially or completely inactive, and that their membership does not reflect changes in the structure of the seed sector. If the private sector is to play a larger role it is absolutely vital that it is represented at such a high-level and that the body has the status to influence government policies and decisions. For example, it should be a formally constituted and recognised committee within the Ministry of Agriculture with a duty to meet and report on a regular basis to a designated senior official, ideally at the Minister or Vice-Minister level.

The question of representation is often difficult in an emerging private sector which may be fragmented have varying opinions and interests. The key step in the development of the private sector is the formation of a National Seed Association that represents the interests of commercial seed companies. Discussions with Government are more easily conducted by such an association than by a few companies, which have their own specific agenda. Recently, we have seen the establishment of seed associations in a few countries of the region, which is a very positive step. This emerged as a major topic of discussion in the recent meeting of the WANA Regional Seed Network Council organised by ICARDA and GTZ in Cairo. Of course, it is also important that these associations are given due recognition by Government and are seen as legitimate representatives and not merely as irritants!

15. EFFICIENCY VERSUS EQUITY CONSIDERATIONS

Many of the issues raised in this paper relate to issues concerning efficiency and equity, which are generally difficult to reconcile and optimise. The justification for privatisation is largely based on the pursuit of increased efficiency in the commercial seed supply, which we recognise will benefit the more profitable crops and regions. However, the Government my also have social obligations to the population in less favoured areas. In the NENA region, the generally low and variable rainfall makes crop production risky over large areas and as a result the benefits gained from efficiency measures may then be limited.

There is another way in which changing government policies can affect seed supply for the less profitable activities. In the past, parastatal organisations, which had a developmental role, would implement programs in line with government policy, even if they were clearly not profitable. This was seen a part of their social function. However, with the restructuring process and with greater managerial autonomy, such companies are being forced to follow more stringent financial criteria. This may cause them to look much more critically at their portfolio of activities, and especially at those, which are largely developmental in character.

The production of forage and pasture seeds may be cited as an interesting example. On the one hand, the importance of managing livestock is constantly emphasised as a key element in improving natural resource management. Livestock management systems in turn usually create a demand for seed of the particular species upon which the improved fodder/pasture system is based. Within the NENA region this typically involves species of medic or vetch. However, despite the substantial social and environmental benefits of better livestock management, it is very difficult to develop a commercial market for these seeds. This is mostly because the benefits of seed purchase are expressed indirectly through animal production and may benefit the community as a whole rather than individuals. Therefore, such seeds are generally unattractive to a commercial seed organisation, even one which is owned by the government. This again brings attention to consideration of the 'social role' of seed supply in non- commercial crops. It is still possible for parastatal organisations, or indeed commercial companies, to implement development activities. However, this should be done on the basis of an agreed contract, rather than simply imposing unprofitable activities on the enterprise.

16. REGIONAL DIMENSIONS IN PRIVATISATION

Government seed organisations and parastatals are designed to serve the farmers of their country and are usually not concerned with exports, except for the occasional disposal of surplus stocks to international organisations. In marked contrast, private companies have to consider and develop any market opportunities that may exist, either internally or in nearby countries, to maximise their business. They may also develop special expertise or have a favourable production environment, which enables them to exploit a comparative advantage in an export market. That is very much the pattern of development we have seen in the international seed trade over the past 50 years, and it is completely contrary to the idea of national self-sufficiency. This may lead some governments to

Copyrighted material

consider classifying certain crops as 'strategic' in terms of the national economy and may affect they way they are handled within seed policy.

Due to the dominant role Governmental agencies have played in the seed supply sector, trade within the NENA region is relatively undeveloped. As a result, there are many examples of countries importing seed from suppliers far away and at great cost. Given the similarity of environments across much of the region, and certainly within sub-regions such as Near East or North Africa, there should be a market for regional trade, and this is likely to be exploited more in the future as the private sector becomes more active. Of course we also recognise that for cereal and grain legume crops, the high costs of transport are a significant constraint to long distance transportation.

Regulatory issues including the testing and registration of varieties are critical to the subsequent physical movement of seeds. The WANA Seed Network, for which ICARDA provides the Secretariat, regards these regional dimensions as a major concern. Harmonisation' efforts should be applied to seed standards, certification procedures and perhaps ultimately to seed laws

17. SEED SECURITY ISSUES

In some countries of the region, erratic rainfall may lead to unexpected demand for seed due to crop failure. Farmers living in regions prone to such climatic uncertainty adopted traditional strategies to cope with these situations. However, with the entry of government organisations into the seed system, issues of national seed security naturally became part of their mandate. Approaches designed for disaster situations included holding a regular carryover stock to respond to unexpected demand or mounting campaigns to procure uncertified 'commercial seed' from farmers in seasons when there was a substantial crop failure in one part of the country. Given the variable climate of the region, these continue to be important activities for some government agencies. Such government involvement echoes the long established statement that seed is a 'strategic input' to agriculture in which government must play a role.

18. FORMAL AND INFORMAL SEED SECTORS IN RELATION TO PRIVATISATION

There is much interest nowadays in the 'informal seed sector', particularly among donors who see this as a way to assist farmers more directly rather than supporting national institutions, which are perceived to be inefficient. In fact, the analysis of seed systems on the basis of their formal or informal elements has been a notable feature in development in recent years. It is appropriate therefore to consider how this analysis relates to the issue of privatisation.

A primary problem in discussing this issue is the definition of these sectors. In the view of the authors, the entire seed requirement of the country, or of any particular crop, is satisfied through formal or informal channels. That part of the seed supply, which is planned and organised by public or private sector organisations, comprises the formal sector, while the remainder is regarded as the informal sector. This is made up mostly of seed, saved on the farm, exchanged at the community level or traded in local markets without any official control. For the major field crops in the NENA region, and in most developing countries, the informal sector accounts for the great majority of the seed supply. The original objectives of most seed projects were to increase the formal sector contribution of seed by aiming for very high seed replacement rates, but this was seldom achieved.

The impact of privatisation on this picture may be expressed in various ways. For example, it may:

- shift the balance of the formal sector activities from public to private,
- decrease the total formal sector by removing the artificial demand created by subsidies on public sector seed, or

- increase the total formal sector by encouraging many new entrants into the seed business who are successful in expanding the market by providing better services and products. These new entrants may be 'recruited' from the informal to the formal sector, as local traders and entrepreneurs become more regular and experienced seed suppliers.

19. THE CONTINUING ROLE OF GOVERNMENT

Despite the strong pressures towards privatisation from donors, individual Governments may wish to tread this path with caution. They will of course maintain their role in regulation and quality assurance and they will probably continue as the major breeder of the self-pollinated crops in association with the International Agricultural Research Centres such as ICARDA and CIMMYT within this region. Because the private sector is not interested in less profitable crops, governments may also be obliged to retain their role in these crops. While most of the seed supply for such crops is applied through informal sources, there is still a need to have some seed production capability to ensure the effective delivery of new materials from research into agriculture.

Thus we may say that continued government research has to be linked to some seed production, at least to the foundation seed level, and probably to certified seed for new varieties to ensure rapid diffusion. The governments' involvement may be seen as a secure 'formal' channel for the primary diffusion of high quality seed, which can then be more widely diffused by the informal sector. If the Government has no such channel available, it must devise and carefully monitor a collaborative relationship with the private sector to ensure that the products of public research, from both the IARCs and National Research Services, are fully utilised and achieve maximum impact.

If this role is recognised and understood, then the Government must to tread a rather difficult path. It must provide a secure diffusion channel for new varieties coming from research, while not disturbing the commercial market in a way that could discourage any potential new participants who may wish to enter.

20. CONCLUSIONS

Privatisation and diversification of the seed supply is one of the main themes in seed programme development, which is likely to remain on the agenda. It is a consequence of national economic policies and of the world-wide trend towards globalisation, and it will also be reflected in the seed policies and laws which countries devise in the future. However, it is clear that technical and economic constraints, which apply to seeds may restrict the extent to which privatisation can be implemented. It must also be accepted that this process cannot be 'driven' in a top down manner to a determined goal. Governments may create a favourable environment and may provide limited support but they cannot guarantee the response of the private sector. That will be determined by the economics of production and by the marketing system and ultimately by output prices on which farmers depend.

It is also necessary to consider the continuing role for Government in those crops and areas, which are unattractive to the established private sector. This in turn invites consideration of alternative solutions to seed supply, which may offer a useful service to farmers at minimum cost.

21. REFERENCES

Heisey, P.W. 1990. Accelerating the Transfer of wheat breeding gains to farmers: A study of the dynamics of varietal replacement in Pakistan. CIMMYT Research Report No 1.

Cromwell, E., S. Wiggins, and S. Wentzel. 1993. Sowing Beyond the State: NGOs and Seed Supply in Developing Countries. Overseas Development Institute, London, UK.

Jaffee, S and J. Srivastava. 1992. Seed System Development: The Appropriate Roles of the Private and Public Sectors. Discussion Paper, 167. World Bank, Washington, D.C., USA.

Klenk, J., C. Philipp, R. Reineke, and N. Schmitz. 1995. Privatisation in Transforming and Developing Economies. Gabler GmbH, Germany.

Tripp, R. 1997. New Seeds and Old Laws: Regulatory Reform and the Diversification of National Seed Systems. Intermediate Technology Publication. London, UK.
Turner, M.R. 1994. Trends in India's Seed Sector. Paper presented at 1st ASIAN SEED Conference, 27-29 September 1994, Chiang Mai, Thailand.

REGIONAL AND SUB-REGIONAL COOPERATION IN THE SEED SECTOR IN THE NEAR EAST AND NORTH AFRICA (REGION)

Prof. Abdalla Ahmed ABDALLA[*]
Chairman, Board of Directors, Arab Sudanese Seed Company, Khartoum, Sudan

1. INTRODUCTION

It is generally accepted that high quality seed is the cheapest and most effective input for improving productivity. Improving access to good quality seed of improved and adapted cultivars is a critical requirement for sustainable agricultural growth and food security. Despite this, the majority of the farmers in the Near East and North Africa region continue to rely largely on their own traditional seed supply systems and hence remain trapped in low productivity.

Available information from the seed sectors in the different countries of the region show that countries have established seed production programs aiming at self-sufficiency from improved seed of their respective major food crops. However, most of these seed development programs remain weak, and unsustainable in several cases, and also poorly linked to the world seed industry. The quantity of seed supplied by the formal public and private sectors is markedly less than the amount of seed required in most of the countries of the region.

Despite many ecological and farming systems similarities and hence similar crops, varieties and seeds, regional cooperation and exchange of information and consultations relating to the seed sector remained meager or non-existent. This paper outlines the present state of the seed sector in Near East and North Africa countries and defines policy programs and regulations aiming at elaborating a regional framework for the improvement of the seed sector.

2. REGIONAL COOPERATION IN THE SEED SECTOR

2.1 Need for Regional Cooperation

The seed supply systems in most of the countries of the Region did not receive the level of attention given to other sectors of agriculture such as research, higher agricultural education and extension. As a result, most of the national seed supply systems remain less inefficient and are often cited as a major constraint to the utilization of new improved crop varieties by farmers. Regional cooperation strengthening national seed systems and effective cooperation will promote seed production and movement across borders.

2.2 Current Seed Supply and Testing Systems

The national seed supply systems in the countries of the Region are at different levels of development in terms of organizational structures, policy, regulations, technology, trained man-power, germplasm management through variety development to seed production, processing and distribution. The national agricultural research and extension systems also vary in their strength and support to the seed supply systems. Some countries in the Region lack the basic elements for an effective seed system such as seed development strategies and national seed policies, legislation, quality control and certification processes. Breeding and testing activities vary from rudimentary to strong systems and are often restricted to introduce varieties.

---

[*] Former Vice-Chancellor, University of Khartoum, Sudan and Former Minister of Agriculture, Sudan.

Farmers' participation in seed development programs, which is essential for successful adoption of the improved varieties produced by the growers, is almost non-existent in the majority of the countries.

A few countries in the region including Egypt, Turkey, Pakistan, Morocco, Algeria and Sudan have progressed in breeding and testing programs, public seed production, and processing and have enacted seed laws which promote privatization of the seed sector.

The current status of regional and international cooperation and coordination in the seed sector is also generally weak. Sustainable seed linkages between the countries of the region are almost non-existent. The only current operational seed link is the ICARDA, WANA Seed Network. The rationale for regional cooperation derives from the need to develop strong national seed supply systems capable of satisfying their respective seed needs from both the formal and informal national seed systems, which should be articulated within a regional framework.

2.3 Common Features of Seed Systems in the Region:

- Large numbers of the small resource-poor farmers rely on their own produced seed of traditional varieties despite the availability of seed of improved varieties.
- The availability of good quality seed cannot meet the need in most of the countries.
- The focus is on grain food crops such as sorghum, wheat, and maize.
- Less attention is given to grain legumes and horticultural crops.
- The public sector or parastatal schemes and agencies still play a dominant role in seed systems, particularly breeding research and extension and often marketing and distribution.
- With the recent adoption of free market policies by most of the countries in the Region, seed policies have changed in several countries to encourage private initiatives in the seed sectors. Private seed companies have recently been established in several countries. Arab-Sudanese Seed Company in the Sudan is one example. It is a company organized by the Sudan government, AAAID and other shareholders and based on the privatization of the Public Seed Administration of the Ministry of Agriculture.

Despite these common features, similarities in the ecological and farming systems, and the potential for the development of several shared crops, regional cooperation, exchange of personnel, information and material has not taken place. In 1992, this situation drove ICARDA to initiate the establishment of a WANA Seed Network where ICARDA takes a catalytic lead role to initiate cooperation and to create regional fora to strengthen the national seed systems. The Network composed of experts, focuses on technical, regulatory and policy issues aimed to integrate seed systems, tackles shared problems, and achieves common goals in addition to supporting other operational activities, including publishing and the distribution of INFO. However, WANA Seed Network, encounters problems relating to the diverse needs of national seed programs, differences in country priorities, and the failure of lead countries in the different categories of activities of the Network to fulfill their responsibilities.

2.4 Constraint Analysis

The major constraints and limitations mitigating progress in the seed sectors of the countries of the Region include the following:

- Development of new varieties is generally weak, mainly due to a lack of qualified breeders.
- Due to weak extension services, the adoption level of the new improved varieties is low.
- Farmers continue to rely on their traditional methods of producing seed and often fail to purchase good seed of improved varieties.

Copyrighted material

- Lack of proper institutional links.
- A focus on a narrow band of crops, which include mainly grains.
- Limited breeder seed and limited testing of value for cultivation use (VCU).
- Inadequate infrastructure (roads, storage).
- Poor linkages at national, regional and international levels.
- Limited trained manpower in seed science and technology.
- Non-coherent seed sector policies, regulation and variety replacement policies.

Taking these constraints and limitations into consideration, the challenge lies in devising appropriate national and regional strategies for seed production, processing, distribution, quality control and marketing at national and regional levels and in a regional framework.

3. IMPROVING REGIONAL COOPERATION

3.1 Streamlining Methods of Seed Production

The major components of the seed industry include (a) variety development comprising breeding, testing and evaluation, (b) seed multiplication, (c) seed processing and storage and (d) marketing and dissemination. Promotion of the seed industry entails improvement in all of these components. Streamlining and the harmonization of methods will facilitate seed production and seed movement in the region. A logical start in this direction requires the utilization of existing opportunities made available by the international centers and fora concerned with one or more of the major seed-development components.

3.1.1 Variety testing

In countries where the seed public sector prevails, variety testing is generally restricted to public sector agencies. With the spread of multi-national companies, testing systems should be transparent and involve organizations other than public institutions in variety testing.

3.1.2 Seed multiplication

In countries with a formal seed-sector, seed production should be expected to follow similar methods and procedures strictly following the recommended steps in seed production. The system aims at ensuring genetic purity through an optional or compulsory program of inspection and certification. Inspections will involve analytical, physiological and sanitary aspects of seed quality.

3.1.3 Seed marketing and trade

Seed marketing regulations are generally governed by national seed laws and are variable across the region according to the level of government involvement in marketing. The present trend is for privatization, which requires the formation of national seed associations to facilitate regional and international cooperation. FIS is the international organization concerned with developing and facilitating inter-country movement of high quality seed. Its membership includes national seed trade association, which represent seed enterprises in their countries. Important standing committees in FIS include trade and arbitration, and a phytosanitary committee.

3.2 Harmonization of Seed Legislation at the Regional Level

In order for farmers to obtain ongoing access to good quality seed and other seed technologies at competitive prices, seeds from national, regional and international and competitive seed industries that are well linked to world seed industry must be available. National seed laws often restrict seed production and trade and impose control on this process.

Seed legislation usually provides the legal framework for seed development including regulations of variety release, and seed certification, processing and distribution. The main features of a seed law include the policy objectives, definitions and the institutional framework. The purpose is to facilitate and regulate seed production and trade and may include phytosanitary aspects. The law should also ensure involvement of all concerned sectors and deter actions harmful to the seed industry. While seed laws should be flexible and accommodating, they should not too relaxed to harm the consumer, nor should they be rigid so that they block seed movement in and outside the country. Seed laws should protect the rights of breeders and of the seed industry while encouraging seed growers and traders to insure fair competition.

It has often been suggested that the harmonization of seed laws would encourage production and seed trade across the region. This approach is emphasized in the World Bank Sub-Saharan Africa Seed Initiative (SSASI). However, harmonization of seed legislation will require a thorough analysis of the existing seed rules in different countries to identify those rules, which have contributed to an enabling or constraining seed trade within and across borders.

Although harmonization may help seed production and trade across countries, it is expected that regulations encouraging broader seed trade and competition may have a greater impact. It is also possible that correct labeling, packaging, and seed registration systems may have a larger impact on improving seed trade than the enforcement of common phytosanitary standards.

3.3 Harmonization of Seed Policies

Seed supply systems are generally influenced by general economic policies governing trade and investment and by regulatory polices specific to the seed sector. Access to quality seed of improved varieties by the small resource poor farmers has often been limited due to national policies that hinder seed development programs. These policies can affect variety introduction and seed imports and inhibit other activities in the public and private seed sector. Other policies affecting components of seed development are related to research, extension and other interventions concerning subsidies and monopolies.

Over the last three to four decades, public sector institutions have played a prominent role in seed development programs. National public research institutions have selected and bred varieties for local conditions while the International Agricultural Research Centers (IARCs) bred high yielding lines and varieties. Parastatal agencies have been responsible for multiplying and distributing seeds to farmers. This system has allowed the public seed sector to monopolize variety introduction thus limiting the activities of the private sector. Top-down government research decisions often over-looked the real seed needs of the growers and thus diminished farmers access to quality seed of improved varieties.

A good seed policy should be country-specific and must address inter-relations and links between seed systems and the cropping system, the legal framework, research, extension and education, infra-structure (roads storage) and economic policies.

The seed industry is becoming increasingly international and private. Worldwide trends affecting the seed industry include the globalization of agricultural research and higher agricultural education, investment in biotechnology research and development (R & D). In addition, a shift in crop improvement from the public to the private sector, the emergence of successful seed companies, greater attention to the informal seed sector and the impact of legislation and trade on property rights can greatly affect seed industry development.

Obstacles created by policies that may hinder seed development and movement include compulsory variety registration as opposed to voluntary registration, compulsory seed certification and other quality controls, a lack of access to public germplasm and breeder seeds, unreasonable phytosanitary rules, and excessively nationalistic seed systems.

The results of the external review of the Seed Improvement Development Program (SIDP) carried out by FAO in 1986 showed the lack of sustainability of the national seed activities in several FAO member countries including some from the NENA region. This situation has recently prompted FAO to initiate the development of a relevant seed policy that will facilitate a sustainable seed industry and create fora for dialogue and consultations amongst various stakeholders. This initiative by FAO should be encouraged and perhaps coordinated with the ICARDA – WANA Seed Network, which has already started such an initiative as part of its policy initiative. However, this initiative is still in a rudimentary phase.

3.4 Seed Association

The need for seed associations has lately received increasing attention. The objective of seed associations is to help organize and regulate the national seed sector and to establish effective partnership with regional and sub-regional seed associations. Moreover, these seed associations can influence governmental decisions regarding the formation of seed laws and accompanying bylaws pertinent to seed business and work closely with concerned players to establish specifications for those interested in getting involved in seed business.

Seed associations in the region are almost non-existent with the exception of a few such as the Egyptian Seed Association (ESAS), which was established in 1998 as a non-governmental non-profit organization. The members of ESAS include breeders, seed exporters, seed importers, and seed growers. The ESAS seeks to tackle constraints in the seed sector, improve seed quality and transfer seed technology to producers. The Association also addresses various seed problems faced by its members, represents the private sector in the governmental institutions and encourages technology use in seed production, trade and quality control.

National and regional seed associations can be formed to deal with many issues related to seed business including intellectual property rights. These associations constitute an appropriate base to deal with the new trend in globalization.

Regional and sub-regional seed growers associations and individual crop associations do not exist in most of the countries of the region. Due to the large area of the NENA region and the similarities in the major crops, it is advisable to look into the establishment of seed associations.

4. MECHANISMS FOR STREAMLINING AND HARMONIZATION

Mechanisms for streamlining and harmonizing should include the following:

- Seed legislation.
- Membership of association with international fora.
- Harmonization of economic and seed sector policies.
- Regional cooperation through formation of networks for:
  Variety testing for a range of environment.
  1. Screening for biotic and abiotic stresses in appropriate environments.
  2. Accelerated seed multiplication and generation advance in off-season nurseries.
- The establishment of more regional centers for seed testing and training. These centers may be associated with selected universities or research institutions.

4.1 International Organizations Involved in the Seed Sector in the Region:

International organizations involved in seed sector activities in the region include:

(i) International Agricultural Research Centers (IARCs), particularly ICARDA, which is located in the region. These centers are directly involved in the first phase of variety development, producing finished varieties, some of which have already been released in some countries, and providing germplasm for breeding purposes.

(ii) International Union for the Protection of New Varieties of Plant (UPOV), which aims at protecting new varieties largely through property rights.

(iii) IARC, UPOV and the International Plant Genetic Resources Institute provide detailed descriptions of varieties for a number of basic field crops. The International Seed Testing Association provides standard testing procedures and specific standards for laboratories conducting seed testing. Creation of such laboratories in some selected countries will facilitate seed movement and provide for seed sector disputes. The establishment of standard seed conditioning procedures and the use of standard equipment will ensure seed quality and facilitate seed movement across borders.

(iv) ASSINSEL - International Association of Plant Breeders for the Protection of Plant Varieties.

(v) WANA Seed Network, located in the ICARDA Seed Unit, aims to integrate national seed systems through the harmonization of seed policies and regulations. Most countries of the region are members of the WANA network. The major objectives of the network make it well suited to lead harmonized efforts aiming at improving national seed industries in the WANA countries and other non-member countries.

5. INSTITUTIONAL ARRANGEMENTS FOR COOPERATION

Successful regional cooperation in the seed sector requires strong national seed systems capable of providing good seeds of improved varieties in a competitive market. Strong national seed systems will be more effective in dealing with regional partners in establishing institutional arrangements. Such arrangements should be well-funded and electronically linked to the regional and international seed industry.

With the increasing trends of globalization and privatization, and other changes related to the seed industry, it is advisable that the countries in the Region establish a regional consultative forum and sub-regional fora. This may start by reorganizing and restructuring the WANA Seed Network (ICARDA) so that it is capable of harnessing and sensitizing the seed sectors in the region and establishing effective communication with international organizations. Sub-regional groups may also be created within the region to improve communication and cooperation. The formation of strong linkages in the region will allow countries to contribute collectively to the building of a stronger and more effective regional forum for the development of the seed sector.

SEED LEGISLATION AND REGULATORY MEASURES IN THE NEAR EAST AND NORTH AFRICA

Andreas HADJICHRISTODOULOU
Plant Breeder - Agronomist, Agricultural Research Institute, Nicosia 2015, CYPRUS

1. INTRODUCTION

For centuries, farmers in the Near East and North Africa (NENA) countries have been selecting seed from their crops (cereals, vegetables, trees, etc), multiplying it, and sharing seed with their neighbors. Variety selection is primarily based on the level of plant adaptation to the prevailing harsh environmental conditions of the Region. In addition, farmers of the NENA region pay particular attention to culinary and other specific qualities of crops, which are seldom part of breeding objectives in modern variety development. As a result, farmers often complain about the taste of modern varieties when compared to their traditional landraces. Farmer preferences have contributed to the maintenance of most landraces and other varieties in the Region. For example, the durum wheat variety *Kyperounda* has been traditionally grown and maintained for decades in Cyprus and Morocco mainly due to the taste it produces in bread and pasta.

In the case of cowpea, farmers in the NENA region prefer traditional cowpea varieties compared to modern varieties. The traditional varieties are indeterminant, with longer growing seasons and maturity periods, while the modern varieties are determinant with short harvesting periods. Farmers prefer indeterminant landraces because of their extended harvesting period, which gives farmers the possibility to consume fresh pods and dry the surplus harvest for winter consumption. On the other hand, modern varieties mature simultaneously, which makes it possible to carry out mechanical harvesting.

In general, the exchange of seeds of improved field crop varieties by the international research centers including CIMMYT, ICARDA, CIAT, and CIP with national breeding programs has been free if the seed is to be used for breeding and multiplication purposes. In an international trial conducted in several European countries by FAO and the Dorum Wheat Network, *Phibirol* a wheat variety that was selected in Cyprus by the author, was among the best performers. The government of Spain expressed interest in the variety and suggested to pay royalties. However, since the original material was received from CYMMYT free of charge, the author decided to turn down the offer and gave the variety *Phibirol* free to Spain. After further selection, the variety was released as *Karpasia* in Cyprus in 1984 and as *Sham 1* (*Waha*) in several other countries including Syria in 1984, Algeria in 1986, Saudi Arabia in 1987, Jordan in 1988, Turkey in 1990, Lebanon in 1994, and Sudan in 1997.

2. THE NEED FOR SEED LEGISLATION

Modern agricultural practices along with the establishment of the World Trade Organization (WTO), and the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) including Plant Breeders' Rights (PBR), have brought significant changes in plant breeding, seed multiplication and trade. The availability of seed of improved varieties at a reasonable price is a prerequisite for any significant progress in agriculture. Therefore, Governments and the private sector must be motivated to invest in highly trained staff and allocate essential resources in the seed supply sector. This can only be achieved, if varieties are registered and intellectual property rights are protected through proper legislation that cover seed trade within and between countries.

3. THE PRESENT SITUATION OF SEED SUPPLY AND LEGISLATION IN NENA

Information regarding seed supply and legislation in NENA was obtained from various sources including FAO documents, country reports, regional meeting reports, and personal experiences. Seed legislation varies significantly within and between countries in NENA. However, seed laws and related regulations are only applied on the "Formal Seed Supply Systems", which cover only 10% of the seed needs of farmers. The remaining 90% of seed need is provided by the "Informal Seed Supply Systems", which are the exchange and sale of seeds from farmer to farmer.

Seed supply is well-developed in Morocco, Turkey, Pakistan, and some other countries that have established seed laws and seed certification systems. Seed quality control is essentially absent in Yemen, Qatar, Kuwait, Oman, and United Arab Emirates, which formally market a very small quantity of seed of the most important crops. Egypt, Jordan, Tunisia, and Syria are in the intermediate group of countries, with reasonably well-developed systems covering major crops.

Seed policies also vary among NENA countries. Morocco, Egypt, Tunisia, Ethiopia, Israel, Turkey and Cyprus have well-defined seed policies. For example, in late 1998 the Parliament of Cyprus approved a new seed law, which covers all aspects of seed production and importation. On the other hand, Iraq, Syria, Yemen, Libya and Jordan lack a defined seed policy, but have seed plans within their national agricultural policies. However, it is important to emphasize that existing seed laws do not apply to the Informal Seed Supply Sector.

Formal seed trade, for which seed laws apply, is controlled and subsidized by governments. Seed trade in the private sector is limited to a few countries and deals mainly with hybrid and vegetable seeds, and a few cereal seeds. Private seed companies operate in Tunisia, Morocco, Turkey, Jordan, Lebanon, Pakistan, and Sudan. In Cyprus, cereal seed trade is controlled by the government, but seed trade of potatoes, vegetables, pulses and forages is dominated by the private sector and co-operatives.

While it is not the aim of this paper to present details regarding specific seed legislation in each country concerning different species of crops, it is important to concentrate on certain aspects of seed legislation that are critical for the improvement of the seed supply sector in the region. Considering differences in economic and social conditions prevailing in the Region, variation in the level of seed legislation among countries is to be expected. However, there is room for improvement. Seed legislation should be established to encourage the involvement of the private sector in seed supply and trade. It is also recommended that the subsidized government controlled activities are reduced to a minimum. In addition, the informal seed sector and its great contribution in the seed trade must be recognized and ways must be found to provide help in order to improve the quality of seed.

4. IMPORTS AND EXPORTS OF SEED OF IMPROVED VARIETIES

The climatic conditions in NENA countries characterized by limited precipitation are generally unfavorable for rainfed crops. Rainfed varieties are adapted to specific, but restricted locations throughout the region. As a result, there is a very limited seed trade of rainfed wheat, barley, and legume and forage crops. Import of seed for vegetable crops including potato, tomato, carrot, watermelon, and hybrid seed of corn, sugar beets, sunflower are common in almost all the countries. Seed trade is generally controlled by local and foreign private companies and co-operatives. Most of the seeds imported by NENA countries come mainly from Europe. There are also very small seed import-export activities within the Region. Seed import regulations exist in Cyprus, Egypt, Tunisia, Sudan, Syria, Turkey, and Yemen. According to country laws, import of seed requires an import permit.

Copyrighted material

5. INTELLECTUAL PROPERTY RIGHTS

It is widely accepted that "Plant Variety Protection" (PVP), which grants "Intellectual Property Rights" (IPR) to eligible plant varieties is essential to increase the availability of good quality seed of improved varieties. Breeding for high yielding varieties with all other desired characteristics requires considerable investments in trained staff and the allocation of funds. If PVP is not granted, the private seed sector will not be willing to invest in plant breeding. At the same time, the availability of seed of improved and protected varieties at low prices in NENA countries and the granting of farmers' rights as defined in the FAO fora are issues to be considered when establishing PVP laws.

Most countries of the region have laws, which require that varieties should be registered to be released for commercialization. However, many countries do not have legislation for PVP. In Cyprus, Egypt, Ethiopia, Lebanon, Libya, Morocco, Oman, Sudan, Syria and Tunisia, registration of varieties for commercial release is carried out through an independent body, by which governments control the evaluation of varieties according to the requirements established by the UPOV Convention, that is Distinctness, Uniformity and Stability (DUS). Some of these countries carried out the Value for Cultivation and Use (VCU) test in addition to the DUS test. In other countries, the evaluation of varieties is conducted by a committee that also includes breeders. Plant Variety Protection does only require the DUS testing. Therefore, in such countries where the DUS testing is already functional for commercial listing, the implementation of PVP laws would not pose practical institutional problems.

In Cyprus, the release of varieties is based on trial results conducted by breeders and decided by a special government committee. Successful varieties are registered in the official commercial catalog, and their seed is multiplied and marketed through the formal system.

Until recently, only Egypt had a law prepared for PVP. The reasons for limited efforts in PVP in the NENA countries related to several factors including the following.

(a) Major breeding programs have been carried out by government employees working in national research institutions or universities that did not seek any reward for their newly developed varieties.
(b) The great majority of seed (90%) is produced by the informal system, which makes it difficult to exercise Plant Breeders' Rights.
(c) Local land varieties of the major cereal and legume crops whose breeders are unknown and, which are not eligible for PVP, are still grown.

At a Plant Variety Protection workshop held in Cairo in 1999, it was indicated that many countries of the region are initiating procedures to develop legislation for the protection of Breeders' Rights. Laws related to PVP are either in preparation or in parliament for approval in Cyprus, Egypt, Ethiopia, Iraq, Jordan, Lebanon, Mauritania, Morocco, Oman, Sudan, Syria, Tunisia, Turkey, and Yemen. In Morocco the law for PVP has been approved, but has not yet been put into practice.

Legislation for the commercial registration and protection of improved varieties are important to motivate scientists and attract private industries in plant variety development.

5.1 Effects of WTO's TRIPS Agreement on Plant Breeding, Variety Protection, and Seed Production and Trade

Several international organizations deal with plant variety protection and grant Plant Breeder's Rights. These organizations include the International Union for the Protection of New Varieties of Plants (UPOV), which is an independent intergovernmental organization working in close collaboration with the World Intellectual Property Organization (WIPO), and the International Association of Plant Breeders for the Protection of Plant Varieties (ASSINSEL).

The agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) is one of the outcomes of the Uruguay Round Agreements under the World Trade Organization (WTO). The TRIPS Agreement was established on January 1, 1995 and is considered the most remarkable multilateral agreement on intellectual property. In regard to plants, the TRIPS Agreement addresses issues related to intellectual property protection of plant varieties, requiring protection either by patents or by a sui generis effective system or by a combination of both. As the Agreement does not define what would be considered a sui generis effective system, it will be for the TRIPS Council to judge. It is considered "effective" by the WTO. Developing member countries are given longer periods than other countries to develop their IPR legislation in compliance with the TRIPS Agreement (Article 65-4). Article 7 of the TRIPS Agreement, entitled Objectives, states: "the protection and enforcement of intellectual property rights should contribute to the technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare and to a balance of rights and obligations".

The TRIPS Agreement also defines in detail national, civil and criminal procedures by which the rights of breeders are to be enforced. For example, it states that procedures must be fair and equitable, not unnecessarily complicated or costly, and should avoid time limits or unwarranted delays. The TRIPS agreement does not intend to restrict trade, but to encourage it in balance with the promotion of technological innovations.

Due to the benefits derived from protected varieties, it is believed that protected varieties are likely to be well-maintained and continue to produce quality seed that is representative of the original variety. As a result, farmers will have confidence in the genetic properties of the varieties, which could have a positive effect on the national, regional, and global seed trade. However, protected material is expected to cost more because of the loyalties that have to be paid to the breeder.

5.2 Plant Variety Protection and Conservation of PGR

As already mentioned, to be granted protection a variety must be new for not being previously commercialized before certain date and uniform and stable in its essential characteristics. PVP granted under the UPOV Convention provides exception for the breeder (the right to use the protected variety for further breeding without the authorization of the breeder) and farmer's privilege (the right to keep seed from a protected variety for further replanting on farmer's own land).

The protection of breeders' rights can help to promote research programs in the development of improved varieties. Enhanced breeding activities can increase the number of improved varieties under cultivation and promote plant genetic diversity across farmers' fields. For example, in Syria only two barley landraces, *Arabic Abiad* and *Arabic Aswad*, had been traditionally grown for decades. Recently, Dr. A. Ceccarelli and his coworkers from ICARDA selected these non-uniform landraces and identified superior genotypes, which have increased diversity in farmer fields.

Increased plant breeding activities also has direct effects on the conservation of plant genetic resources (PGR). Heitz (1998) stated that the main objective of plant breeders is not only to create new and uniform varieties, but also to maintain a large genepool to be used as a genetic reservoir for future breeding programs. Therefore, the introduction of PVP legislation, which promote plant breeding activities, will help maintain the genetic diversity by:

(a) Increasing the number of uniform varieties

(b) Increasing in the diversity of gene pools that are maintained by private breeders or public institutions for future breeding to meet competitions and challenges.

FAO, IPGRI, ICARDA and other international or regional organizations are involved in collecting, documenting, conserving, utilizing and exchanging PGR in the NENA region. The PGR of the NENA region must be made available to breeders or scientific researchers on mutually agreed terms. The

PGR from the region should be studied, conserved, and better managed. This would facilitate the marketing of genes and generate financial benefits from breeders who develop commercial varieties from NENA's material.

The introduction of legislation on breeders' rights is a system that reward breeders for their innovative efforts. As it is often the case, plant breeders use in their breeding programs the varieties that have been maintained by farmers; they improve these varieties and protect the new varieties, which are resold as seed to farmers. However, farmers, especially subsistence farmers, who have conserved the PGR of the region for generations. As it is often the case, plant breeders use in their breeding programs the varieties that are maintained by farmers; they modify these varieties and protect the new varieties, which are resold as seed to farmers. This was recognized as a problem by FAO member countries and the issue was addressed in the Resolutions 4/89 and 5/89 of Plant Genetic Resources for Food and Agriculture (PGRFA).

5.3 Farmers' Rights

Farmers' Rights were recognized and endorsed at a Conference in 1989 by FAO member countries in the International Undertaking on PGRFA. Farmers' Rights defined as the rights arising from the past, present and future contributions of farmers in conserving, improving, and making available plant genetic resources, particularly plants from the center of origin. Farmers' Rights are vested in the international community, as trustees for present and future generations of farmers, for the purpose of ensuring full benefits to farmers, and supporting the continuations of their contributions, as well as the attainment of the overall purposed of the International Undertaking (FAO, 1989). As a result, breeders' lines and farmers' varieties can be made available only with the agreement of individuals, communities, or institutions that developed or maintained the varieties.

A great part of improved varieties throughout the world were developed from materials collected from developing countries. Therefore, it appears important that developed countries assist in efforts to strengthen the capacity of developing countries to conserve, develop, and use their national plant genetic resources. In this regard, the establishment of a global fund was suggested at the 1991 FAO Conference on PGR in Rome. The resolution C5/91 gives details on the establishment of this International Fund for PGR in developing countries. However, no specific agreement on the nature and size of country contributions to the fund was reached.

The International Undertaking also recognizes the sovereign rights of nations over their plant genetic resources. In this regard, at a South Asia-Southeast Asia and the Pacific meeting, it was proposed to establish an international taxation system on the sale of plant varieties and products of plant origins under the Intellectual Property System. The revenue collected through this tax system could be used to pay royalties to the country that provided the parent materials. However, the ways to implement this innovative idea are still a matter of discussion.

Most of the farmers in NENA are subsistence farmers who rely on their landraces of food legumes, forages and some cereal species for their livelihood. Therefore, seed legislation must provide adequate protection of Farmers' Rights for varieties that are used by breeders. In addition, any PVP law should include provisions to ensure the farmer's privilege at least to poor farmers in order to encourage farmers to continue participating in PGR conservation.

5.4 Impact of Plant Variety Protection Systems and Innovative Genetic Engineering Technology on Farmers' Variety Choice

The application of genetic engineering technology in plant breeding has recently increased in developed countries. Genetic engineering is slowly but steadily being applied in the NENA region. Clearly, substantial progress in plant adaptation to dryland areas and resistance to disease cannot be achieved by conventional breeding alone. Therefore, despite the negative public perception associated with biotechnology, genetic engineering technology will continue to be critical to the future development of new varieties in the NENA countries.

Varieties or landraces developed and maintained at high cost by breeders or farmers can be modified by genetic engineers at low cost. This can be accomplished by inserting one gene to produce an "essentially derived variety". The concept of essential derivation is related to the degree of similarity between the parent varieties and the derived variety. For the resulting variety to be "essential" there must be a high degree of similarity with one of the parents and a minimum number of characteristics (at most one) inherited from the second parent (if there is one). This facilitates an equitable share of benefits among holders of breeders' rights, and patent owners of the additional gene.

The provisions of the 1991 UPOV Convention offers a possibility to balance the rights of breeders of the "initial variety" and that of genetic engineers (patent owners). For example, the provisions extend breeders' rights from the "initial varieties" to the "derived variety" and breeder authorization is needed in order to apply commercialize the derived variety. The advantage of this arrangement is that it promotes investments in classical breeding and discourages unfair or parasitical activities without discouraging genetic engineering application.

It is important that countries in the NENA region adapt these agreements to their specific conditions. By balancing the rights of conventional breeders, genetic engineers, and farmers, it is more likely that the availability of improved varieties will be increased and sustained.

6. FARMERS' ACCESS TO IMPROVED AND ADAPTED VARIETIES

The region shows a trend of a widening gap between production and consumption at a rate of 1% a year. This has made NENA the largest food-importing region in the developing world. Self-sufficiency and food security can be achieved by several measures including an increase in the availability of quality seed of improved and better performing varieties of food and feed crops at reasonable prices. This would require a strong and efficient seed supply sector.

The main advantages of improving the seed supply sector in the region include the following:

- Increase the availability at low cost of improved and adapted varieties that have the qualities preferred by farmers of NENA.
- Create a system for the multiplication and trade of seed according to international quality and phytosanitary standards.

7. UPGRADING BREEDING CAPABILITIES

The development of genetically superior varieties is a prerequisite for future improvements of agriculture in the region. Currently, breeding programs, especially for major food crops including wheat, barley, and legumes, are concentrated in government controlled institutions. The private sector involvement in plant breeding and seed production is limited and deal mainly with vegetables and hybrid seed. However, in the past 20-30 years, there has been a positive contribution by the CGIAR institutes including CIMMYT, ICARDA, IPGRI, CIAT, and IITA throughout the region. These institutions have upgraded the research and breeding capabilities in the region.

Breeding and seed supply activities can be enhanced if legislation on Intellectual Property Rights (PVP and patents) is introduced throughout the region. In this regard, private breeders and government institutions would be motivated to develop better varieties to compete in a free seed trade market. The economic incentives created through these new systems would make a positive contribution by promoting the use of more efficient breeding and screening methods suitable for the region and increase the adoption of new varieties by the farmers. Unsuitable material would be eliminated and breeders of this material would face economic failures. Profit-oriented breeding activities will generally utilize the most efficient methods including biotechnology to achieve goals faster, and will attempt to minimize costs. Under these conditions, the private sector would be expected to increase its share in breeding and government institutions and universities would have to upgrade their research and breeding capabilities to cope with the new conditions.

It is generally believed that the introducing breeders' rights and related legislation would have a negative impact on the protection of farmers' rights and conservation of plant genetic resources. However, this issue can be addressed by proper legislation arrangements and other measures discussed earlier.

Several countries in NENA have already started introducing legislation on the protection of varieties. Countries appear receptive to formulate concrete regulations based on the experience of Europe and other regions.

8. SEED PRODUCTION AND TRADE

Currently, the seed trade of major cereals and legumes is government subsidized and controlled. The private sector handles mainly hybrid seed and other elite material. Seed trade is generally restricted to within-country exchanges of self-pollinated cereals and legumes, with only limited exchange of seed between countries in the region and with some European countries. The introduction of legislation on PVP and seed trade based on WTO agreements will improve the availability of quality seeds to farmers. In addition, enhancing and modernizing breeding methods will increase the varieties of food crops with wider adaptation, and ultimately increase seed trade and availability of seed. The availability of hybrid seed would be improved if uniform legislation on seed trade is introduced in the region.

A combination of these factors would have a positive effect on good quality seed availability. By increasing the volume of seed traded in an open market, the cost of production to companies is expected to be reduced. The price of seed for subsistence farmers should also be reduced. As a result of growing better varieties, yields will be higher.

The Informal Seed Sector, which controls most of the seed trade of major food crops in the region is expected to be negatively affected as the role of the private sector expands. Assistance must be provided, especially on seed cleaning and seed health, to the informal seed sector in order to improve seed trade. Assistance should continue over the next 10-20 years as the informal seed sector is gradually transformed into a formal seed sector.

9. NEED FOR CO-ORDINATED EFFORTS

It is clear from this study that procedures to establish seed legislation and plant variety protection laws should be based on specific conditions of each country. Although unique seed legislation for all NENA countries cannot be expected, the general principles of seed legislation apply to all countries. Therefore, coordinated efforts should be strengthened to develop general principles, which could be adapted to the specific conditions of each country. The assistance of international or regional organizations including FAO and ICARDA is critical to the establishment and development of these regional efforts. In addition, the existence of country seed legislation based on harmonized regional principles would facilitate seed trade among NENA countries.

10. REFERENCES

Bragdon, S and D.R. Downes. 1998. Recent policy trends and developments related to the conservation, use and development of genetic resources. Issues in Genetic Resources No. 7, IPGRI, FAO, Rome.

FAO, 1999. Seed Production and Improvement: Assessment for the Near East and North Africa. Working document for Regional Meeting on Seed Policy and Programmes in the Near East and North Africa, 27 June - 2 July 1999, Cyprus

FAO, 1996. The State of the World's Plant Genetic Resources for Food and Agriculture (Background Documentation prepared for the International Technical Conference on Plant Genetic Resources, Leipzig, Germany, 17-23 June, 1996.

FAO, 1989. FAO Conference Resolution 5/89-Twenty-fifth Session of the FAO Conference. Rome 11-29 September. 1989.

Government of Cyprus, 1998. Seed Law No. 63 (I) of 1998. Cyprus Gazette, Part 1 (I), No. 3253 of 10.07.1998.

Heitz, André. 1998. Intellectual property rights and plant variety protection in relation to demands of the World Trade Organization and farmers in Sub-Saharan Africa. Paper presented at the Technical Meeting on Seed Policies and Programmes for Sub-Saharan Africa, Abidjan, 23-27 Nov.,1998.

ICARDA. Focus on Seed Programs. Country Reports for Cyprus (1997), Egypt (1995), Ethiopia (1998), Lebanon (1997), Libya (1995), Morocco (1994), Oman (1998), Sudan (1994), Syria (1995), Tunisia (1997).

ICARDA. 1998. Annual Report for 1997. ICARDA. Aleppo, Syria.

McGovern, E. 1995. Intellectual Property. Pages 21, 11-1 to 21, 24-4, In: International Trade Regulations. Globefield Press, Globefield, Essex, England.

UPOV, 1991. International Convention for the Protection of New Varieties, 1961, 1972, 1991. UPOV, Geneva.

UPOV, 1996. Model Law on the Protection of New Varieties of Plants, Articles 1-57. UPOV PUBLICATION No. 842 (E), Geneva.

IMPROVED SEED PRODUCTION AND TECHNOLOGY TRANSFER TO FARMERS IN THE NENA REGION

AMIR MUHAMMED
Asianics Agro-Dev. International, Islamabad, Pakistan

Summary

Production and use of improved seed depends on the availability of improved, high yielding and well-adapted varieties. Plant breeding research in the NENA region is almost exclusively conducted in public sector research institutions. The major emphasis of breeding programs in the region is on cereal crops especially wheat, barley and maize. Variety improvement programs mainly use conventional cross breeding techniques. However, some countries in the region including Pakistan and Turkey have well-established mutation breeding programs. Genetic engineering techniques are also being used in some countries to improve specific characters. The CGIAR centers are an important source of improved germplasm of their mandated crops, which is freely shared with the national agricultural research systems to be released as improved varieties after local selection or as breeding materials to develop improved varieties.

With financial and technical assistance, several countries have developed large seed industry projects from the World Bank and other donors. These initiatives have helped to increase the availability of certified seeds of major crops. However, the supply of improved seeds through formal sources is still only a small fraction of the total demand. To bridge this huge gap in several countries, large multi-national companies have developed programs to market hybrid seed of selected crops. The domestic private sector is also involved in seed production in selected areas, but once again efforts are modest compared to demand. The private sector needs special incentives to get initiatives established. As a result, a major source of seed at the farmers' level still comes from the informal sector. The quality of farmer seeds can be significantly improved if farmers are given basic training in seed production, cleaning and storage.

The transfer of technology (TOT) to farmers promoting the adoption of improved seed is essential to ensure that farmers understand the importance of improved seed in achieving sustainable higher crop yields. Stakeholders in TOT need up-to-date information on improved varieties and sources of improved seeds to advise their clients. TOT also has to take into consideration the great diversity in the target group of farmers and the type of improved technology desired to be transferred. Various mechanisms for TOT used in the region have been described. It has been emphasized that different strategies and mechanisms for transfer of technology to farmers need to be devised according to the nature of the improved technology, target group and the area.

The main responsibility for TOT lies with the agriculture extension services within the provincial /state agriculture departments. However, despite the extensive infrastructure and sizable budget, the extension services are generally considered ineffective in TOT. The private sector should be encouraged to assume a more vigorous role in TOT. Research institutions, especially those devoted to individual crops (wheat, rice, maize, cotton etc.), can be effective in transferring information on these crops in areas where the crop is a predominant component of the farming system. This approach has been attempted successfully with several crops including rice and cotton in Pakistan. The private sector can be effective in TOT especially if information is supported by credit and inputs to ensure that improved technology will enhance on-farm production. Rural NGOs, farmers' organizations and entrepreneurs can also play an effective role in TOT.

1. INTRODUCTION

Agriculture is the mainstay of most of the countries in the Near East and North Africa (NENA) region with the exception of the oil-rich countries. The agricultural sector constitutes more than 70% of the gross national product (GNP) of the non-oil producing countries and people living in rural areas of these countries depend primarily on agriculture for their livelihood. The agricultural sector also contributes directly to the priority national goal of achieving maximum food security in most developing countries of the NENA region.

Average yields of most crops are quite low compared to their yield potentials (30-40%). The yield gap for major crops in Pakistan is given in Table 1.

Table 1: Yield Gap (1994-95)

Crop	Yield Potential Kg/ha	National Yield Kg/ha	Yield Gap Kg/ha	Unachieved Potential (%)
Wheat	6425	2081	4344	68
Paddy	9489	2433	7056	74
Sugarcane	185000	47000	138000	75
Cotton (lint)	1400	557	843	60
Potato	38128	13942	24186	63

While factors responsible for the large yield gaps have been identified in several countries, remedial measures require a major effort due to the complexity of the agriculture sector. Due to widespread poverty and low incomes in the rural areas, improving production efficiency and increasing yields is considered of highest priority to improve the quality of life of rural population.

The agricultural sector consists of crops, livestock, forestry and fisheries, and the relative importance of these sub-sectors is different in various countries. However, crops are often the predominant component and most of farming families are directly involved in crop production. Any efforts designed to improve agricultural productivity, average family incomes, and the overall national economy must therefore focus on increased production of major crops. While a large number of factors are responsible for the ultimate crop yield, the characteristics of the crop varieties used and quality of seed are critical. It is therefore important to ensure that healthy seed of improved high yielding varieties, well-suited to local agro-ecological conditions and possessing the required characteristics of tolerance/resistance to the prevalent stresses, are used. This goal can only be achieved if:

- there is a sufficient supply of quality seed available through the public and private sectors to meet the requirements of the area to be planted to various crops; and
- farmers are aware of the value of improved seeds in achieving higher crop yields and net income.

Farmers also need timely information about improved varieties for their area and proper seeding rates and procedures for selected varieties. This requires vigorous and effective transfer of technology programs geared to different categories of farmers in various agro-ecological zones, which is the subject of this paper.

This paper reviews plant breeding research in the region to improve crop varieties, mechanisms used to multiply seed of improved varieties and efforts to educate and motivate farmers to use improved seeds. Since there is a great deal of diversity in the countries of the NENA region, it is difficult to comprehensively review the situation in all the countries. However some general patterns common to all countries have been described. Recommendations have been made based on the experience within the region (especially in Pakistan) and to improve plant breeding research, seed production and distribution, and efforts to educate farmers to use quality seed and improved agronomic practices.

2. PLANT BREEDING AND SEED SCIENCE RESEARCH

The objective of plant breeding research is to improve crop varieties that are high yielding, have desirable characteristics to meet the market and consumer requirements, and are well adapted to the local environmental conditions, especially the prevalent temperature, soil and pest stresses. All the countries in the region have plant breeding research programs, but the quality and extent of the programs vary widely depending on the size of the country, availability of expertise, and financial resources to undertake such research. Primary responsibility for plant breeding research lies with the state agriculture departments who entrust plant breeding efforts to state-run agriculture research institutes/stations and agriculture universities/colleges.

Most of the research on variety improvement has been concentrated on main cereal crops (wheat, barley and maize). The main reason for a strong emphasis on cereal crops has to do with the high national priorities to achieve food security through sustainable increased production of main cereal crops. As a result, wheat, the predominant cereal crop in the region, is assigned the highest priority in plant breeding and agronomic research. Several countries including Saudi Arabia, Egypt, Iran, Pakistan and Turkey have been able to increase their wheat production substantially, largely through well-organized research efforts and appropriate government policies to stimulate increased production. Several countries with well-developed national agricultural research systems (Pakistan, Egypt, Turkey, and Iran) also undertake plant breeding research on important cash crops including cotton, sugarcane, horticultural crops and rice. Private sector research in plant breeding is virtually non-existent in the region with the exception of some multinationals that undertake development of hybrid varieties of selected crops. Most of the plant breeding research carried out in the private sector involves classical hybridization of selected parents to evolve improved genotypes.

At the international level, the Consultative Group of International Agricultural Research (CGIAR) has established sixteen international agricultural research centers (IARCs) to undertake research on crops, livestock, forestry, aquatic resources, water management, food policy and strengthening NARS. The IARCs with a global or regional mandate for the sustainable improvement of the productivity of various crops are listed in Table 2.

These centers undertake massive plant breeding efforts in their mandated crops to produce improved genotypes suitable for a great variety of environmental conditions especially in the developing countries. The IARCs also have maintained close liaisons with scientists in the national agricultural research systems (NARS) for a two-way exchange of information on the need for new varieties and the availability of improved germplasm. Nurseries of improved germplasm of selected crops are distributed by the international centers to relevant plant breeders in developing countries. Plant breeders can then select varieties best suited to their environment for use either directly as commercial varieties or to improve breeding material for utilization in their research programs. This mechanism has greatly facilitated the evolution of improved varieties, especially in wheat, rice, maize, potato and beans. The improved germplasm of these crops has helped increase crop yields in most developing countries, resulting in greater food production and availability to the rapidly growing population

Besides cross breeding, the other major technique used for variety improvement is mutation breeding, mainly through the use of ionizing radiation. This method supplements the conventional cross breeding techniques in most crops and has a distinct advantage in selected situations. Many improved varieties of several crops have been released for large scale sowing that has resulted in dramatic yield increases in several countries. One significant example is the release of a mutant variety of cotton - NIAB 78 in Pakistan, which resulted in an almost 300% increase in cotton production in the country within 3-4 years and a major improvement in the overall national economy.

Table 2: Crop Research in the IARCs

Center	Main Crops
CIAT- International Center for Tropical Agriculture, Cali, Colombia *(Founded 1967).*	Beans, Cassava, Tropical Forages
CIMMYT - International Center for the Improvement of Maize and Wheat, Mexico City, Mexico *(Founded 1966).*	Wheat, Maize, Triticale
CIP- International Potato Center, Lima, Peru *(Founded 1971).*	Potato, Sweet potato
ICARDA - International Center for Agricultural Research in the Dry Areas, Aleppo, Syria *(Founded 1977).*	Wheat, Barley, Chickpea, Lentils, Pasteur legumes
ICRISAT - International Crops Research Institute for The Semi-arid Tropics, Patancheru, Andhra Pradesh, India *(Founded1972).*	Sorghum, Millets, Chickpea, Pigeonpea, Groundnut
IITA - International Institute of Tropical Agriculture, Ibadan, Nigeria *(Founded 1967).*	Maize, Cassava, Cowpea, Plantain, Soybean, Yam
IRRI - International Rice Research Institute, Los Banos, The Philippines *(Founded 1960).*	Rice
WARDA - West Africa Rice Development Association, Bouake, Côte D'Ivoire *(Founded 1970).*	Rice in West Africa
IPGRI - International Plant Genetic Resources Institute, Rome, Italy *(Founded 1974).*	Plant Genetic Resources

Source: CGIAR Annual Report 1997.

A vast majority of the farmers in the NENA region are small holders who face many agro-ecological and economic constraints in achieving high crop yields from the available natural resources of land, water and climate. Main problems in achieving sustainable high yields are the prevalent and emerging biotic and environmental stresses and lack of financial resources to purchase the costly inputs and line up the necessary farm machinery recommended to achieve optimum crop yields. *The challenge to the plant breeders, therefore, is to develop crop varieties that are well suited to the local agro-ecological conditions and give good yields even with low external inputs and use of family labor and animal power instead of costly and sophisticated farm machinery.*

The requirements for improved technology of the large holders and corporate farmers are often quite different from those of the small farmers. While large holders require crop varieties that cope with the prevalent environmental stresses and are well adapted to the agro-ecological conditions, their preference is for high yielding, input responsive varieties that are amenable to mechanized farming. They view agriculture as an industry and try to maximize their net profits from the investment. *Plant breeders must therefore develop varieties both for the resource poor small farmers and the well-endowed and highly mechanized large holders and corporate farmers.*

In order to derive full economic benefits from the improved varieties, it is essential to develop a complete package of production technology for every new variety for different agro-ecological conditions and crop rotations. The objective of such agronomic-economic research should be to stabilize crop yields against various types of environmental risks and optimize farmers' net profit from the use of family labor and purchased inputs. Agronomic research should aim at reducing the cost of production to enable the resource poor farmers to adopt the improved technology. Such agronomic research is not adequate in most countries and needs to be strengthened and better integrated with plant breeding research.

Well-organized and efficient NARS can be an important instrument in improving agricultural productivity and the net income of farmers. However, most of the NARS in the region suffer from a variety of constraints and their overall efficiency and effectiveness is quite low. One of the IARCs-

International Services for National Agricultural Research (ISNAR) is exclusively devoted to assist NARS in achieving this goal. A regional organization of NARS, the Association of Agricultural Research Institutions in the Near East and North Africa (AARINENA) was also formed about 15 years ago to help exchange the experiences of various NARS in the region. Unfortunately, due to a lack of financial resources it has been relatively inactive. Recently, the Global Fund for Agricultural Research has established a NARS-Secretariat at FAO headquarters, which is providing the necessary financial and technical assistance to regional research organizations including AARINENA to make them more effective in supporting the regional NARS.

Although a modest base of plant breeding research exists in several countries in the region, there is an almost complete neglect of research in seed science *per se*. Similarly the subject of seed science is neglected in the curricula of most agricultural institutions, which needs to be rectified. Research in post harvest handling of seed, seed physiology and pre-sowing treatment can substantially enhance the performance of seed in terms of crop yield.

3. SEED MULTIPLICATION AND MARKETING

In order to benefit fully from breeding research, multiplication of seed of improved varieties must meet the requirements of maximum numbers of farmers. This has traditionally been performed by farmers, or in some cases, by farmer's co-operatives. With the advent of the Green Revolution, the importance of improved varieties and quality seed was fully realized by policy makers and international development agencies. Through development assistance from the World Bank, other regional banks and bilateral aid agencies including the USAID, determined efforts were made to organize the seed industry working on modern lines in the public sector. The development package in most cases included hardware for the seed processing industry and its installation, training of manpower for commercial seed production on government farms or through contract growers, and processing the selected seed lots for certified seed production and distribution.

Simultaneously, the private sector and NGOs also organized different sized operations to produce improved seed of selected crops and to distribute seed to growers after processing in their plants or through the public sector seed processing plants. These efforts greatly increased the availability of improved seed to ordinary farmers. However, there is still a large gap between supply and demand of improved seed in most developing countries including countries in the NENA region. This situation has led to adulteration in the production of certified seed, especially in Pakistan where farmers complain bitterly about the poor quality seed even from state approved outlets. As a result, most farmers in the NENA region have to rely on their low quality home grown seeds.

The requirements and availability of certified seed of selected crops in Pakistan is given in Table 3. Even with maximum capacity production by the public and private sector, only about 10.5% of wheat and 34.5% of cotton seed requirements were met in 1997-98. Judging from the persistent complaints of farmers, some of the improved seed sold to the farmers, especially in the case of cotton, is often of poor quality.

3.1 Strengthening the Private Sector in Seed Production

Despite the development of large seed industry projects, the availability of certified seeds of most crops is still far below requirements throughout the region. This gap in demand and supply can only be filled by developing a vigorous private seed sector and improving the quality of the informal seed sector. However, entrepreneurs in the private sector continue to face many constraints in their efforts to develop viable projects in the NENA region.

Copyrighted material

Table 3: Estimated Seed Requirement and Seed Distributed During Last Five Years.

Crop/Year	Estimated seed Requirement (Mt.)	Seed distributed (Mt.)	%
Wheat			
1993-94	706824	56045	7.72
1994-95	733545	80840	11.02
1995-96	733545	85383	11.64
1996-97	739000	77023	10.42
1997-98	739000	78544	10.53
Cotton			
1993-94	67806	26499	39.08
1994-95	58298	28453	48.80
1995-96	66000	31295	47.42
1996-97	66000	26635	40.35
1997-98	67000	23128	34.52
Rice			
1993-94	44000	2170	4.93
1994-95	43000	2662	6.19
1995-96	49000	3517	7.18
1996-97	43000	1751	4.10
1997-98	43000	1734	4.03
Maize			
1993-94	35900	1631	4.54
1994-95	35600	2201	6.18
1995-96	35000	2032	5.80
1996-97	35000	2011	5.74
1997-98	35000	1674	4.70
Sunflower			
1993-94	410	271	66.09
1994-95	525	359	68.38
1995-96	808	586	72.52
1996-97	1750	807	46.11
1997-98	1000	571	57.10
Vegetables (excluding potatoes)			
1993-94	4000	N.A.	-
1994-95	4000	N.A.	-
1995-96	4900	4052	82.69
1996-97	5000	4603	92.06
1997-98	5000	3181	63.62

All vegetable seeds, sunflower seeds (hybrid), and maize seeds (hybrid)] were imported.

3.2 Measures to Improve the Private Sector

Some of the measures required to stimulate the private sector in the region are listed as follows:

- Assured availability of pre-basic seed from research institutes.
- Soft loans for establishing seed production, processing and storage units.
- Provision of state land for seed farms.
- Concessions in levies and taxes to import machinery and market products.
- Regulation of marketing of non-descriptive seeds.

Copyrighted material

4. TRANSFER OF TECHNOLOGY TO FARMERS

Improved technology can achieve its purpose only if it is effectively transferred to and adopted by farmers. Effective technology transfer can result in higher agricultural production and increased net incomes of farming families, which has a positive impact on rural poverty. Improved crop yields will reduce costly imports of agricultural commodities and the cost of production of basic raw materials for agro-industries. In the long run, the adoption of improved technology by farmers can make agro-industries more competitive in the international markets. In addition, increased agricultural productivity may also have a positive effect on the often hard-pressed national economies of the region.

4.1 Stakeholders

Because of the sizable economic and political gains from effective technology transfer, governments often emphasize agricultural extension programs in their national planning programs. Public sector agencies, especially the agriculture extension departments of the provincial/state governments, audio-visual media institutions and publication centers, agriculture universities, and research institutes undertake transfer of improved technology to farmers. Other public sector agencies involved in the transfer of technology (TOT) are the agriculture credit organizations including private banks, manufacturers and suppliers of agricultural machinery and inputs, and the seed industry. Stakeholders in the private sector involved in TOT are NGOs working to improve economic conditions of farming communities and farmers co-operatives. Because of the growing importance of the agriculture sector and a move towards privatization in the public sector, most activities concerned with the production, import and distribution of agricultural inputs have been transferred from the public to the private sector. The extensive network of domestic and multi-national organizations engaged in these activities are also actively involved in TOT, with the main objective of promoting the sale of their products. The list of stakeholders involved in TOT is therefore quite extensive and diverse.

4.2 Diversity of Target Groups and Nature of Improved Technology

To be successful, the methodology for transfer of technology has to take into consideration the profile of the target group and the nature of the improved technology to be transferred. Considerable research has been done on the great diversity of farming community and the nature of commodities and technological innovations that can be transferred. The target groups in the region vary widely from the resource poor, illiterate landless tenants to the well-endowed, well-educated and sophisticated large holders and the corporate farmers. Similarly, the nature of improved technology intended to be communicated also covers a wide range. Straightforward information including names of the improved crop varieties or optimum seed rates and dates of sowing that can be easily understood even by illiterate farmers can be easily communicated through various forms of media. More sophisticated technologies including the use of an implement on a machine for special farming operations on the use of toxic chemicals on sensitive crops require more elaborate and often costly mechanisms for effective transfer to farmers. *Thus there is a great diversity in the target groups and the nature of technology intended to be transferred.* This complex menu also requires tailor-made mechanisms for efficient communication of information for specific situations.

Research scientists and extension workers often complain that, in spite of their best efforts, farmers do not adopt improved technologies. They overlook the fact that improved technologies that they try to "sell" to the small farmers are often produced implicitly for large farmers and therefore are unsuitable for the conditions under which small farmers work. Besides, small farmers have a wealth of experience developing successful innovations that work well under their conditions, but which scientists working in research stations are unaware of. Therefore, scientists and extension workers need to interact more closely with farmers and not merely "transfer" improved technologies. Chambers and Ghildyal (1985) analyzed the issue of transfer of technology to resource poor farmers in detail and observed the following:

"--There is much evidence and understanding that when resource poor farmers (RPFs) do not adopt technology, it is usually not from ignorance, but because the technology does not fit their needs, and their physical, social and economic conditions. Technologies, whether biological or physical, bear the imprint of the conditions in which they are generated. They are then adaptable in similar conditions, but often not adaptable where conditions differ. As it is often the case, many conditions on research experiment stations and in laboratories are close to those of resource rich farmers, but sharply different from those of RPFs. "

Chambers and Ghildyal (1985) have also proposed a "Farmer First and Last-FFL" model. The essential elements of this model are compared to the conventional TOT model in Table-4.

In order to develop successful programs to improve agricultural productivity and net incomes for the RPFs, careful attention must be paid to the real situation of the RPFs when designing research experiments and transferring the information to farmer.

4.3 Mechanisms for Technology Transfer

Several mechanisms are used by different stakeholders for transfer of technology to different categories of target groups. These include (i) audio-visual media, radio, television, mobile video vans, (ii) print media-leaflets, brochures, illustrated booklets, wall charts and posters, (iii) demonstration plots in rural areas, (iv) rural fairs and corner meetings (v) farmers days at research stations (vi) farmer contact with seed dealers (vii) farmer education by field staff of NGOs and seed companies and (viii) extension by agro-industries (floor mills, rice mills, oil processing units, sugar mills, dairy plants). Relatively simple technologies, including the transfer of names of improved varieties and information about optimum seeding rates and sowing dates can be easily communicated, even to illiterate farmers, through the basic tools used for extension-radio. The more sophisticated technologies require the use of TV or mobile cinema vans and demonstrations by extension staff.

Table 4: Transfer of Technology (TOT) and Farmer-First and-Last (FFL) Model

Parameters	TOT	FFL
Research priorities determined mainly by:	Needs, problems, perceptions and environment of scientists	Needs, problems, perceptions, and environment of the farmers
Crucial learning is that of:	Farmers from the scientists	Scientists from farmers
Role of farmers:	Beneficiary	Client and professional colleague
Role of scientists:	Generator of technology	Consultant and collaborator
Main R&D locations:	Experiment stations, laboratories, and greenhouse	Farmers' fields and conditions
Physical features of R&D mainly determined by:	Scientists' needs and preferences, including statistics and experimental designs	Farmers needs and preferences
Non-adoption of innovations explained by:	Failure of farmer to learn from scientist	Failure of scientist to learn from farmer
Evaluation:	By publications By scientists peers	By adoption of technologies by farmers

Copyrighted material

Technologies to farmers becomes more complex when other factors such as soil types, agro-ecological conditions, weather conditions and crop rotations are taken into consideration. Such information would require more sophisticated means of information transfer such as the print medium, lectures and discussion groups.

4.4 Strengths and Weaknesses of Agricultural Extension Methodologies

The simplest, least expensive and probably most effective mechanism for transfer of technology, especially to illiterate small holders, is still the public sector radio service, which has improved its performance over time with different innovations. However, it has limitations in that it is only appropriate to transmit simple messages such as the names of improved varieties and other farm inputs and critical dates for various farm operations. Almost every household in the region, even in remote areas, has a transistor radio, which provides to the family a valuable contact with the outside world and is also a source of entertainment and information. Radio played a pivotal role in popularizing the green revolution technologies.

TV has gained increasing popularity even in the rural areas and has become an important medium for transfer of more sophisticated information about improved technologies to farmers. In addition to agriculture extension departments. who run regular programs almost daily, this medium is also used by research institutions, agriculture universities and other public sector organizations for dissemination of their improved technologies to farmers. Although very effective in transferring even sophisticated technologies to farmers, the use of TV for TOT is still limited because many rural areas do not have electricity or TV coverage.

The print medium is useful for mounting special campaigns to introduce new technologies or to warn farmers against environmental hazards or other harmful farm practices and innovations. Wall posters, especially illustrated ones, are very effective in conveying the message to farmers. The main limitation of this medium is that there is a high level of illiteracy in rural areas.

Direct contact with farmers by employees of agencies in the public and private sector is the most effective mechanism for the transfer of information. However, person to person contact is relatively more expensive and its coverage is also somewhat limited due to the lack of availability of extension agents and the high costs involved. Demonstration plots of improved varieties and technologies are highly effective in motivating farmers to adopt improved technology. Unless an extension agent explains the whole process and especially describes the economic incentive for improved technology, farmers are likely to be skeptical about its profitability.

4.5 Technology Transfer by Different Stakeholders

4.5.1 Extension departments

Technology transfer by public sector organizations, especially extension departments, is generally considered relatively ineffective. The main reasons relate to a lack of career structures for extension staff, poor transport facilities to reach the rural communities lack of mechanisms to keep extension agents up-to-date on new technologies, and ineffective linkages with research institutions. In most cases, technology packages propagated by the extension departments for crop production fail to consider prevailing weather and agro-ecological conditions.

Information on improved varieties is perhaps the easiest information to transfer, especially when the improved varieties are not particularly sensitive to weather and soil conditions. This is perhaps the main reason why extension departments in most countries have been successful in communicating the green revolution technologies, which consist of improved seed of crop varieties and timely use of fertilizer. Increasing the use of farm machinery to prepare land for different crops and soil types, seeding methods, fertilizers and chemicals for weed control, has resulted in economically efficient packages of production technologies for different agro-ecological conditions and crop rotations.

Effective transfer of these technologies into farmer fields requires a close linkage of extension departments with research institutions. This would allow extension agents to be properly updated about the details of the new technologies and therefore facilitate their effective transfer to farmers. However, because collaboration between extension services and research institutes have not been met in most countries of the region, the effectiveness of the extension efforts to communicate somewhat sophisticated improved technologies to farmers is quite low. Based on the current constraints faced by most extension departments in the public sector, it is perhaps futile to give responsibility of technology transfer of relatively sophisticated technology to the extension departments.

4.5.2 Research institutions

Due to the growing dissatisfaction with extension departments, there has been an increasing trend in recent years for research institutions to be directly involved in TOT. Several agricultural universities that are responsible for basic and applied agricultural research in their provinces/states have also developed well-equipped TOT departments to undertake extension activities in selected areas. These departments maintain close liaisons with influential farmers in the project areas and arrange for visits of farmer groups to the university campuses for discussions with the research scientists who have developed improved technologies. During these visits, there is a two-way exchange of information. Researchers also get first hand information about the emerging problems on farmers' fields, which is then incorporated in the research agenda. Punjab Agricultural University in Ludhiana, India is an excellent example of a university setting where such direct transfer of technology through farmers' days on-campus has been highly effective in substantially increasing yields of several crops, especially wheat, rice and sugarcane.

Other development that has taken place during recent years is the emergence of a large number of mono-commodity and mono-discipline research institutes, which undertake research on a single commodity or discipline that has overwhelming importance for the agricultural economy of the region. Pakistan has developed commodity research institutes focussing on rice, wheat, maize, sugarcane, oilseeds, fruits and vegetables. These include research in all disciplines besides plant breeding to develop complete packages of improved technology for the crop. There are also research institutes that specialize in soil science, soil salinity and plant protection. It is often difficult to package the improved technology developed by specialized research institutions extension packages designed for farming systems. Several commodity institutes therefore find it more effective to deal directly with farmers who primarily grow these commodities and transfer their improved technologies to them. Direct transfer of technology from research institutions is particularly effective when dealing with relatively sophisticated technologies, which do not consist only of improved products (new variety, machine or chemical), but also include improved techniques and efficient utilization of the natural resources. *An important explanation for the success of TOT by research institutions is the strong motivation of the research scientists to promote their innovations in the farmers' fields, which also helps them in their career improvement.*

4.5.3 Private sector

The main stakeholders for transfer of technology relating to improved varieties and seed in the private sector are farmers' co-operatives, national and multi-national seed companies, NGOs and the agro-processing industries. There are only a few successful farmers' co-operatives in Pakistan, which presumably is also the case in most other countries in the NENA region. These co-operatives are village based or include farmers from several adjoining villages. They obtain basic seed of improved varieties from public sector institutions and multiply it on their farms. They then supply improved seed to other members along with details of production technology for their specific agro-ecological conditions. Since they are small operations they do not use audio-visual or print media for dissemination of information to their members.

Seed companies are a major stakeholder in the seed business and undertake vigorous campaigns to promote their special products among farmers. The major seed industry in most countries is often a

Copyrighted Material

parastatal organization mainly producing certified seed of important self-pollinated crops. These parastatal organizations operate mainly as businesses and as a result their TOT activities are quite modest. There are complaints that, because they are in the public sector, these organizations are influenced by large farmers who can wield a lot of political support to improve their personal business interests, but which may adversely affect the quality of seed.

Multi-national seed companies such as Cargill, Pioneer, Pacific, Sandoz and Lever Brothers, which operate in several countries in the region have well-organized TOT programs to promote their products. Some of these companies have their own research stations and seed multiplication farms in addition to the seed processing plants. In most cases, the seed companies limit their operations to hybrid seed of maize, sunflower and other oilseed crops, vegetables and fodder crops. They have well-organized programs for farmer education and dissemination of information in relation to improved crop varieties and use of quality seed. They also have more credibility with the growers compared to the public sector organizations and are considerably more effective than the state run organizations and institutions.

In some cases, multinationals dealing with hybrid maize have contracted farmer growers to use improved seed along with the necessary inputs and have guaranteed to buy back the produce at agreed prices for further processing. The farmers find such a package very attractive and have readily adopted the new technologies. Several other agro-processing industries have adopted this mechanism to promote improved technologies with their contract growers.

4.6 Interplay Between Public and Private Sectors

There is considerable interplay between the public and private sector in the area of seed improvement and distribution. Field testing of candidate varieties to be released is done by various institutions including variety registration departments and private and multi-national companies. Seed companies also obtain information from public sector research institutions and seed departments on approved varieties that can be commercially multiplied for sale to growers. Breeders and agronomists of public and private sector organizations also share knowledge on varieties and requirements for further research.

National seed companies in the region are often much smaller in size and deal only with one or two selected crops. In Pakistan, these companies are limited to the production of cotton seed. They operate mainly through direct contact with farmers often through their agents and usually do not undertake any activities to transfer technology.

Rural NGOs often work to achieve the broad objective of increasing the net income of rural communities by improving the efficiency of their agricultural production. This inevitably concerns the use of improved seed and agronomic practices. NGOs educate farmers in their project areas about new varieties available and in some cases try to obtain good quality seeds for distribution. The credibility of these organizations with the farmers is much better compared to the public sector organizations and as a result, the farmers readily act on their advice. Unfortunately, very few of these NGOs have facilities to undertake adaptive research and produce their own certified seeds.

The agro-processing industries dealing with rice milling, corn products, sugar production and vegetable oil production have a vested interest in improving varieties grown by farmers correspondingly. They often make a special effort to educate farmers on latest improvements in crop varieties and agronomic practices. In some cases, the mills also sell seed of improved varieties for their target crops on credit to the farmers and their agronomists visit farmers to encourage the adoption of improved technology.

5. CONCLUDING REMARKS

The importance of improved varieties and quality seed has been recognized by most countries where agriculture is the predominant sector of the national economy. In addition to strengthening their crop breeding programs and establishing better liaisons with international agricultural research centers to obtain improved technology, the national agricultural research systems have been strengthened to generate improved crop production technology to help increase agricultural production. However, despite the critical role seed plays in improving yields, research in seed physiology and other aspects of seed science is limited or non-existing in the NENA region. Similarly most research in crop production emphasizes the biological rather than the economic aspects at both the national and local level. In order to develop packages of technology to optimize sustainable resource use in different agro-ecological zones, the results of biological research must be incorporated into farming systems.

To bolster efforts to increase agricultural production, the seed industry has been established in the public sector to facilitate supply of certified seeds of important crops to farmers. Persistent efforts by public sector extension departments and the relevant private sector organizations have raised awareness among farmers of the value of improved varieties and quality seeds in increasing yields and net income.

The private sector seed industry along with NGOs are playing an important role in producing quality seed and promoting its use. However, for many crops there is still a gap between demand and supply. Only a small fraction of the seed requirements are is met in the region. Provided that governments develop policies to facilitate the involvement of entrepreneurs, particularly in the initial stages the private sector can play a leading role in seed production.

Another important concern related to the quality of seed supplied to farmers. There are persistent complaints because of mixture with other varieties and poor germination seed from public sector organizations and several small private sector companies is sub-standard. This affects farmers' confidence and undermines efforts to promote improved seed especially with small farmers. In order to restore farmer confidence in improved seed, efforts have to be made by the seed certification agencies of the government to ensure that quality standards are maintained and defaulters are strictly punished.

To bridge the large gap between seed demand and supply, it is essential to develop the informal seed sector, which could be accomplished by enabling individual farmers or village level cooperatives to produce and process improved seed on their own fields. This would require that farmers are subsidized to cover the costs to purchase machinery and are granted better credit to establish village sized seed cleaning plants. Special training in seed production and processing would also have to be given to farmers so that they could meet seed requirements in their villages. Production of seed by farmers would be better adapted to the local conditions and considerably cheaper than purchased seeds. Furthermore, it is likely that farmers would be more careful about the quality of seed than some of the commercial organizations, including the public sector seed industry.

Public sector extension programs are limited due to from several constraints, which hamper their performance. The career structure of extension personnel is not attractive and as a result, there is little incentive to work hard and show results. The success of extension depends on research generating information about new technologies. In many countries, extension and research departments are almost totally isolated and there is little effective interaction between the two. The result is that extension personnel are out of date in regard to improved technology and therefore lose with the farmers. Although, information on simple technology improvements including new varieties and some agronomic practices have been effectively communicated by extension departments, little effort has been made to disseminate information integrated land use packages for different agro-ecological situations with a cost/benefit analysis. This is important because farmers are primarily interested in increasing their net profit. Improved technology is only a mechanism to achieve that objective.

6. REFERENCES

Ahmed, I.S. 1999. Seed Certification Department, Government of Pakistan, Islamabad. *(Personal communication).*

Ahmed, I.S. 1994. Seed Research, Production and Availability to Farmers. In "Institutional Reforms to Accelerate Irrigated Agriculture, Volume-II -Special Studies". John Mellor Associates Inc. Washington D.C. and Asianics Agro-Dev International, Islamabad, (Study 8, pp. 321-353).

Chambers, R., and B.P. Ghildyal. 1985. Agricultural Research for Resource Poor Farmers: The Farmer First and Last Model. Institute for Development Studies, Susex.

Consultative Group on Intentional Agricultural Research. 1998. Annual Report.1997. CGIAR Secretariat, The World Bank 1818 H Street, Washington D.C.

Ministry of Food, Agriculture and Livestock, Economic Wing, Pakistan. 1997. Pakistan Agricultural Data, Government of Pakistan, Islamabad. Pakistan

Muhammed, A. 1994. Extension. Published in "Institutional Reforms to Accelerate Irrigated Agriculture, Volume-I - Main Report. John Mellor Associates Inc. Washington D.C. and Asianics Agro-Dev International Islamabad, (Chapter 9 pp. 228-238).

Plucknet, D.L. 1993. Science and Agricultural Transformation. IFPRI Lecture Series. September 9, 1993. International food Policy research Institute, Washington D.C.

Naqvi, S.H.M 1994. Cotton Research and NIAB Approach to Research Organization and Management. Published in "Institutional Reforms to Accelerate Irrigated Agriculture, Volume-II - Special Studies". John Mellor Associates Inc. Washington D.C. and Asianics Agro-Dev International Islamabad. (Study 3A. pp79-101),

Copyrighted Material

ASSESSMENT OF VEGETABLE SEED PRODUCTION AND SUPPLY IN THE NEAR EAST AND NORTH AFRICA REGION[9].

Ayman ABOU-HADID.
Professor of Horticulture, Director, Central Laboratory for Agricultural Climate, Agricultural Research Center, Ministry of Agriculture and Land Reclamation, EGYPT.

1. VEGETABLE PRODUCTION IN NENA REGION

According to the FAO yearbook (1997), the major producers of vegetables in the Near East and North Africa region are in Turkey, Egypt, Tunisia, Morocco, and Jordan. The most important crops are tomato (458,000 ha), potato (478,000 ha), watermelon (284,000 ha), melon (181,000 ha), cucumber (87,000 ha) and green beans (85,000 ha). The highest vegetable production in the region is in Turkey (642,000 ha), followed by Egypt (543,000 ha) and then Morocco (132,000 ha). Tunisia, Yemen, Jordan, and Libya produce the same crops in less than 75,000 ha each. The amount of seed utilized for these crops are particularly high in Egypt and Turkey (FAO, 1998). The cultivated areas for some other crops including potato and sweet potatoes are presented by FAO (1997, 1998). Turkey produces potato in about 225,000 ha, followed by Egypt (113,000 ha) and then Morocco (66,000 ha). FAO (1997) also has data on other vegetable crops that are grown in a limited area and some vegetables that are normally propagated by seedlings or vegetative reproduction. Among these crops, potato is the most important crop in the region. Most of the tubers are imported from countries outside the region.

Protected cultivation in the NENA region includes glass houses, polyethylene houses and low tunnels. This vegetable cropping system is important in Turkey (33,833.6 ha), Egypt (17,200 ha), Morocco (5,530 ha), Tunisia (3,486 ha), Syria (2,250 ha) and Jordan (1,140 ha). In Turkey and Egypt, low tunnels are of a significant importance.

It is interesting to note the differences in the FAO and the Arab Organization for Agricultural development estimates on area cultivated by vegetable crops (FAO, 1997; 1998; Arab Organization for Agricultural Development, 1997). In many cases, the area cultivated of a given vegetable was sometimes twice in one source compared to the other. This indicates that efforts should be made to obtain more accurate estimation of regional production of vegetable. FAO (1998) has information vegetable productivity per unit area and total production for some vegetable crops in the NENA region.

Based on the above-mentioned information and data presented in Table 1, it is estimated that vegetable crops occupy 1.36 million hectares in the NENA region. This demonstrates the importance of vegetable crop production in the regional economy. The importance of vegetable crop production is clearer when the net income of areas cultivated with high cash income generated vegetable crops is compared to that of other crops.

FAO (1997, 1998) indicated large variability in productivity of almost all the vegetable crops per unit area in different countries. One reason that accounts for such variability related to the lower quality of seed used in open field vegetable cultivation throughout the region. Countries, which utilize higher quality seeds, usually improve the productivity. This is quite clear when the average yield of protected cultivation is compared to that of open field vegetable production in different countries. Another possible reason for the differences in productivity among countries in the region could be that cultivars that were bred for other climatic regions and/or to be cultivated in different soils or planting dates were used. These points introduce the importance of using high quality seeds that are specifically developed for the region.

---

[9] Detailed data related to vegetable seed production in the NENA region are presented in the annexes 1-8.

Copyrighted material

2. ASSESSMENT OF VEGETABLE SEED PRODUCTION

According to FAO (1987), only Turkey and Egypt have plans for vegetable seed production and vegetable seed quality control. National needs of seed of some vegetable crops were estimated based on the total area of vegetable crop production in the countries of the region and the seeding rate per unit area. To a great extent, activities related to variety improvement, evaluation and maintenance were left to governmental research institutes. However, numerous drawbacks of governmental operations in seed production have been noticed in the last decades in countries of the region. Due to lower quality of production, this situation has contributed to a marked deterioration and losses of farm incomes and imbalances in imports and exports. The lack of well-established vegetable seed industries has resulted in an increase of imports of more superior seeds to the region. In most countries, about 100% of seed required for protected vegetable cultivation are imported. However, much of the imported seeds are not well adapted to the local environment. This leads to crop failures and in the process farmers who have lost faith in traders. It is now clear that seed production requires the long-term involvement of experienced scientists along with suitable funds.

Breeder, foundation and registered seed production is a non-commercialized process under the responsibility of governments. However, due to current governmental conditions, breeder and foundation seeds have suffered in quality.

Seed processing, storage, distribution, and quality are inter-related issues. The major bulk of produced vegetable seed is processed either manually or at government facilities, which normally only process rice and wheat seeds. Some private companies have recently built facilities to ensure quality of vegetable seeds. Storage is often in the open and is certainly not conducted in properly conditioned facilities.

Private companies in the region should take the lead in vegetable seed production. It is recommended that such companies work towards fulfilling vegetable seed requirements of the region using state of the art technologies and local knowledge and experience. It is not possible for these companies to compete on the regional or international level without international collaboration. Local companies that are already involved in seed production should be encouraged to work closely with national scientists in the field of vegetable breeding working in the National Research Systems (NARS). In order to achieve this goal, contracts should be established between researchers or research institutions and the seed industry.

3. ESTIMATION OF SEED SUPPLY SOURCES IN THE REGION

Statistics related to the estimation of seed supply sources in the region are not readily available. The author has therefore had to rely on personal correspondence with scientists in the region to collect relevant information. As Turkey and Egypt are the main vegetable producers in this area, information on these two countries is available.

3.1 Saudi Arabia

The area of vegetable crops in Saudi Arabia has been estimated by Al-Harbi (unpublished data) to be 156000 ha. Based on this information, the need for imported vegetable seeds in Saudi Arabia is estimated as follows:

- tomato has 27,676 ha cultivated area, which requires 29.0 tons of seed;
- watermelon has 25,676 ha of cultivated area requiring 29.1 tons of seed;
- onion has 14,213 ha for that are cultivated and requires 252.9 tons;
- okra has 10,602 ha, that are cultivated and requires for 84.3 tons;
- squash has 8,220 ha, that are cultivated and requires 22.9 tons;
- melon has 84,11 ha, that are cultivated and requires 18.8 tons;
- eggplant has 6,517 ha, that are cultivated and requires 6.4 tons;

- cucumber has 5,481 ha, that are cultivated and requires 16.4 tons;
- carrot has 3,004 ha. that are cultivated and requires 0.9 tons of seed; and
- others have 28,420 ha.

3.2 Lebanon

Lebanon imports a considerable amount of vegetable seed. According to unpublished data, Lebanon imports about 18,000 tons of potato seed annually. For example, no records for the imported quantities of seeds for other vegetables are available. (Yousef Abou Jawdah, personal communication).

3.3 Egypt

The annual production of certified seeds in Egypt in 1998 is presented in Table1. ICARDA (1997) and Agrawal (1986) have presented detailed studies on the production of vegetable seeds in Egypt and the cash value of seeds of vegetable crops. The summaries of these studies are presented in annexes 7 and 8.

Table 1. Annual amount of certified seeds produced in Egypt in 1998.

Crop	Amount of certified seeds (tons)	Imported seeds (%)		Crop	Amount of certified seeds (tons)	Imported seeds (%)
Tomato	95	100		Cauliflower	6	20
Pepper	13	30		Spinach	60	6
Eggplant	15	8		Okra	85	
Water melon	175	8		Jews mallow	130	
Cucumber	110	100		Radish	20	
Melon	70	20		Turnip	55	
Squash	145	5		Lettuce	50	0.1
Green beans	1550	1		Parsley	30	
Peas	1100	0.3		Rocket	40	
Cow pea	410			Carrot	60	66
Cabbage	13	25		Table beet	4	50

Seed Technology Department, Agricultural Research Center, Egypt, 1998-unpublished data)

3.4 Turkey

The amounts of both imported and production for vegetable seeds in Turkey are presented in the Tables 1 and 2.

Table 2. Imported quantities of seeds (Kg) of F_1 vegetable hybrids in Turkey

Year	Tomato	Cucumber	Pepper	Eggplant	Squash	Melon	Watermelon
1988	1400	19000	--	500	13000	1700	--
1990	7538	35000	--	505	13000	3551	--
1992	4661	32122	110	859	10576	1923	8871

After Tuzel and Eltez, Cited in Abou-Hadid (1997)

Table 3. **Local total seed production in Turkey (tones.)**

	Vegetable	Field Crops	Forage Crops	Oil Seeds	Potato	Total Market
Local	1563.0	351,759.4	4,403.0	4,002.0	23,327.0	385,054.4

After Tuzel, personal communication.

There are mainly two sources of vegetable seeds in most countries in the region. Seeds that are imported from international markets, which are often of high quality and are used in protected cultivation and for some high value cash crops such as potato and strawberry. The second source of seed comes from local seed production, which is in most cases lower in quality resulting in a reduction in productivity of many of the local varieties and cultivars. However, it is not recommended to substitute totally these cultivars with imported seeds when looking for quick improvement in productivity. Although characterized by low productivity, many of the local varieties and cultivars possess a special taste or are resistant to disease or abiotic stresses. Efforts to improve local varieties could result in higher yield while mounting adaptability to local conditions. It is therefore suggested to improve local varieties and regional breeding programs.

4. RELATIVE CASH VALUE OF SEEDS

The protected cultivation of vegetable crops depends mainly on hybrid seeds of high value. For example, the price of one kilogram of non-hybrid cucumber seed in the Egyptian local market is about US$ 60–80. In contrast, the price of a gram of hybrid cucumber seed is US$ 3–3.6 (US$ 3,000–3,600/Kg). In other words, the total cost of seed for open field cucumber (estimated at 272 tons) in the region could be estimated at about US$ 19 million, while the cost of protected cultivation hybrid cucumber seed (estimated at 9.04 tons) in the region is about US$30 millions. This example applies to most vegetable crops in the region.

5. ASSESSMENT OF THE STATUS AND POTENTIAL OF RESEARCH ON VEGETABLE CROPS

The region has a wealth of scientific institutions working on vegetable research, including seed production and technologies. One of the difficulties researchers working on vegetable breeding face is the fact that it is time consuming. For example, a researcher in vegetable breeding may need to dedicate ten years to produce a new commercial variety, which is considered as one of the conditions for staff promotion that are followed by research organizations and universities. Therefore, it would be helpful if regulations in the field of plant breeding are changed to recognize the difficulties plant breeders face in variety production.

The features of current research on vegetable seed can be summarized as follows:

i. Institutes working in fields related to vegetable crops are available in the region. These institutes conduct research, training and extension activities in different fields of horticulture. Considerable research is done on vegetable crop production as well as variety trials in most of the national research organizations.
ii. Staff working in most of these institutes are national, well-educated personnel. In some of the countries the staff includes expatriates.
iii. Experimental field stations and facilities are available throughout the region.
iv. Most of the organizations working in agricultural research produce their own publications, which make information available for the scientific community.

v. In most cases, funds are available to conduct research related to vegetable production in general, not necessarily on seed production or breeding programs.
vi. Some countries have seed evaluation and registration programs.
vii. A limited number of countries have programs for breeding vegetable crops, but with modest access to the seed production industry.
viii. A limited number of countries have facilities for DNA mapping and biotechnology.

6. ROLE OF NATIONAL AND INTERNATIONAL INSTITUTIONS IN VEGETABLE CROP SEED SECTOR

The role of national and international institutions in creating favorable conditions for seed production in the region is quite limited. The FAO has published a document on improved seed production for vegetable seeds as well as other crop seed production (FAO, 1987). This publication can be used as a guide to formulate, execute and evaluate seed production projects.

The national agricultural research systems in the countries of the region have departments of horticulture research or specifically vegetable research. In some countries, such as Egypt, there is a department for vegetable seed research. Such national organizations are the cornerstone of any development related to vegetable seed production. However, it is well known that seed production is an expensive capital investment. The availability of cash together with the low rate of return for seed production projects creates major restrictions for the seed industries. Governments should make available soft loans to encourage growers or investors to take the risk of establishing seed industries. One of the leaders in this approach is the Multi Sectors Support Program (MSSP) in the Ministry of Agriculture and Land Reclamation in Egypt. This program offers funds for developmental projects in Egypt with a long enough grace period for recipients to pay back the loan. The program has financed two projects for vegetable seed production in the past two years.

Seed programs require time to achieve their goal and should be a collaborative effort between national and international organizations. In order to encourage international donors and institutes to participate in regional and local seed production, the national structure should first be organized to facilitate international cooperation. The identification of local and/or regional programs for vegetable seed production should be the first step in this direction. This includes selection of priorities of crops and a time frame for the proposed developmental program. The program should also take into consideration competitors or collaborators.

7. PROMOTION OF SEED CERTIFICATION AND VARIETY PROTECTION RULES AND REGULATIONS TO FACILITATE VEGETABLE CROP SEED PRODUCTION AND TRADE

The Egyptian experience including regulations for variety testing and legislation for the introduction of new varieties will be considered. The law of agriculture Number 53 (1966) contained modified regulations of seed certification and variety registration in Egypt. This law was the base of a new protocol for variety registration of Agricultural crops issued by the Ministry of Agriculture, ministerial decree number 82 1998. The protocol put into action the protocol to be followed for the registration of all new crop varieties before being permitted to be used in Egypt.

The different institutes of the Agricultural Research Center are responsible for conducting field trials on new plant materials. The reports of tests are to be submitted to the Central Committee for Agricultural Variety Testing. The permission of any variety to be handled in the Egyptian markets or to be used in Egyptian agriculture depends on the approval of the committee after 2-3 years of field trials. Fees to field-test vegetable crops range between 200 and 400 Egyptian pounds (£E) per year and registration fees are between £E 1,500 and £E 4,000 (£E = US$ 0.294).

The test field design is planned and supervised by a technical committee of two plant breeders, specialists in statistical analysis, pest and disease, end user of the crop (consumers or representatives of industry), agricultural economists, and a representative of the endorsement authority in the Ministry of Agriculture. The committee can also include a biotechnology specialist for the analysis of DNA or protein.

The field tests include distinction, uniformity and stability of the variety and tests for the variety performance and the commercial, economical, and industrial value of the product. The tested variety is given a commercial name based on suggestions from the organization submitting the test request.

The Egyptian example could be modified to keep up with the pace of development in the modern vegetable seed industry. One of the possible constraints in this example is the three-year investigation period required to register any new vegetable seed name for trade. Nevertheless, this example illustrates important procedures that protect both the growers and the seed companies.

8. REGIONAL COLLABORATION/COORDINATION IN VEGETABLE CROP VARIETY IMPROVEMENT

One of the most important benefits of regional and international cooperation in vegetable breeding programs is the exchange of germplasm among nations aiming at wider variability for breeders. Up to now, there is no evidence of coordination or collaboration either in vegetable crop variety improvement, extension and dissemination or in seed production and commercialization in the region. The arena is almost left entirely to the international market and to competition between international seed companies. Some of these seed companies have special research and development sites in countries such as Egypt, where Pioneer seeds has a well-organized research and demonstration farm.

The Arab Organization for Agricultural Development (1998) has proposed a regional project for hybrid seed production. The proposed project aims to produce vegetable seed to satisfy 10% of the regional demand of the four major vegetables under protected cultivation, which include tomato, cucumber, pepper, and cantaloupe. The capacity of the project is to produce about two tons of seeds annually at a cost of 4 million US Dollars. The proposal was presented to possible investors for funding.

9. IDENTIFICATION OF CONSTRAINTS FOR NATIONAL/ REGIONAL VEGETABLE CROP SEED PRODUCTION AND SUPPLY

i. In relation to production of breeder seed, plant breeders do not have enough financial support to conduct long-term breeding experiments and work.

ii. A severe deficit in technical personnel needed to support successful breeding programs.

iii. Unavailability of tools and equipment required for the production of seeds and proper storage facilities to keep produced seeds in good condition.

iv. Difficulties in exchanging plant materials to be introduced in breeding programs between countries. Some of these problems are related to unsuitable quarantine regulations and others are related to a lack of international contacts.

v. Breeding fields in many cases are not standardized; the segregation distances are often not enough to prevent the mechanical mix up of seeds or the cross pollination among varieties. The end result is the production of lower quality of seeds.

vi. Although the funds for research in general is available, there has been a lack of funds to carry out sustainable breeding programs. The participation of the private sector in seed industry has been seriously limited in the past decades.

vii. Major seed production companies are hesitant to invest in the seed industry in the region. This is mainly due to political and economic instability.

viii. Some of the national governments have established seed production facilities. The capacity of such facilities is often quite limited and the quality of operation is generally below international standards.

ix. Most of the countries are slow in establishing national germplasm banks and/or central facilities for plant resource collection. It is only in the recent years that some of the countries have established such facilities or started the efforts to do so.

x. Local seed storage facilities are often not suitable, resulting in the reduction of seed quality in the local markets and contributing to the domination of imported seed over a large sector of horticultural crops, especially vegetable hybrid seeds.

xi. The agricultural quarantine regulations are not strictly applied. The result has been the importation of varieties and hybrids of unknown origin, which has led to the deterioration of many local varieties.

xii. Difficulties in the registration of new varieties surrounding time (three years to be accepted as a new variety) and cost. To a large extent, this prevents the new local varieties from being recognized in the local markets.

10. CONCLUSION AND RECOMMENDATION

- Vegetable production in the NENA region is an important sector of agriculture.
- Vegetable seed, especially in protected cultivation, is a major component of agricultural production.
- Seeds are generally dependent on either local production of low quality seeds or imports of high quality hybrid seeds.
- In the recent past the seed industry in the region has been dependent on governmental organizations, which have faced lots of difficulties.
- Cost involved in the vegetable hybrid seed industry is high with a low internal rate of return for the projects.
- Projects related to seed production in the region are quite limited.
- The national capacity for seed production is in research and technical institutions.
- Small vegetable production companies cannot compete inside regional or international markets of vegetable seeds.
- The private sector should be encouraged to participate in vegetable seed production.
- Joint ventures for seed production is one of the most reasonable strategies for developing seed production in the region.

11. REFERENCES

Abou-Hadid. 1997. A contribution towards a data base for protected cultivation in the Mediterranean region." FAO Regional Working Group publication.

Agrawal, R.L, 1986. Seed technology. Oxford &IBH publications. New Delhi. Agricultural Research Center Publication Egypt. 1993.

Arab Organization for Agricultural Development. 1998. National meeting for the protected cultivation officials, Rabat, Morocco, 17-19 June (1996).

Arab Organization for Agricultural Development. 1997. Statistics Yearbook.

FAO 1998 (http://www.fao.org) and FAO yearbook vol. 51, 1997.

FAO 1987: Improved Seed Production. Plant production and protection, Rome.

ICARDA,. 1997. Protected cultivation in Arab region, in protected agriculture. ICARDA. Statistical yearbook- Central Agency for Public Mobilization and Statistics, ARE, 1998.

Contact persons for unpublished data or personal communications:

ABOU-JAWDAH Y.A.; American University of Beirut, Lebanon. Abujawyf@aub.edu.lb

Al-Harbi , A., King Saud University, Saudi Arabia. E mail aharbi@ksu.edu.sa

TUZEL, Y; Ege University - Izmir – Turkey. tuzel@ziraat.ege.edu.tr

Annex 1 - Area of vegetable crops and estimation of seeds inputs in some countries of NENA region

Country *Crop*	Egypt		Morocco		Tunisia		Turkey		Jordan		Yemen		Libya	
	Area (Ha)	Seed (Tons)	Area (Ha)	Seed (Tons)	Area (Ha)	Seed (Tons)	Area (Ha)	Seed (Tons)	Area (Ha)	Seed (Tons)	Area (Ha)	Seed (Tons)	Area (Ha)	Seed (Tons)
Asparagos	-------	-------	27,692.3	664,615.4	-------	-------	3.0	72.0	-------	-------	-------	-------	-------	-------
Green Beans	15,000.0	1.260.0	3,000.0	252.0	400.0	33.6	54,800.0	4,603.2	1,748.0	146.8	1,778.0	149.4	-------	-------
Cabbages	18,200.0	6.6	750.0	0.3	1,000.0	0.4	29,600.0	10.7	1,160.0	0.4	90.0	0.0	200.0	0.1
Eggplants	29,000.0	20.9	1,600.0	1.2	-------	-------	32,600.0	23.5	2,800.0	2.0	400.0	33.6	270.0	0.2
Cantaloupes and Melons	20,000.0	52.8	25,000.0	66.0	8,000.0	21.1	116,000.0	306.2	2,000.0	5.3		-------	-------	-------
Okra	5,416.7	130,0	-------	-------	-------	-------	6,100.0	219.6	800.0	28.8	3,000.0	108.0	-------	-------
Green Peas	15,500.0	1,488.0	12,000.0	1,152.0	-------	-------	8,700.0	835.2	238.0	22.8	-------	-------	2,300.0	220.8
Pumpkins and Sqoash	32,000.0	115.2	6,000.0	21.6	5,000.0	18.0	23,000.0	82.8	2,000.0	7.2	-------	-------	2,500.0	240.0
Spinach	2,850.0	68.4	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Tomatoes	175,000.0	126.0	25,000.0	18.0	23,300.0	16.8	158,000.0	113.8	15,019.0	10.8	15,129.0	10.9	9,500.0	6.8
Watermelons	65,000.0	195.0	12,600.0	37.8	27,000.0	81.0	135,000.0	405.0	3,017.0	9.1	7,139.0	21.4	11,000.0	7.9
Cucumbers and Gherkins	18,500.0	66.6	3,300.0	11.9	2,000.0	7.2	49,000.0	176.4	1,500.0	5.4	600.0	2.0	550.0	2.0
Cauliflower	4,800.0	4.6	2,400.0	2.3	360.0	0.3	4,900.0	4.7	1,991.0	1.9	-------	-------	400.0	0.4
Garlic	7,000.0	3,360.0	3,000.0	1,440.0	1,000.0	480.0	14,000.0	6,720.0	1,000.0	480.0	1,000.0	480.0	-------	-------
Carrots	4,250.0	35.7	10,600.0	89.0	5,500.0	46.2	11,000.0	92.4	563.0	4.7	832.0	7.0	5,500.0	46.2
Total	**412,516.7**	**6,929.7**	**132,942.3**	**667,707.5**	**73,560.0**	**704.6**	**642,703.0**	**13,665.4**	**33,836.0**	**725.3**	**29.968.0**	**788.7**	**32,220.0**	**524.4**

Source of Area FAO 1998 (http://www.fao.org) and FAO Yearbook vol. 51, 1997.
All values under seed quantities are estimated based on the statistics of cultivated area.

Annex 2 - Area of vegetable crops and estimation of seeds inputs in some countries of NENA region

Country / *Crop*	U A E		Kuwait		Syria		Qatar		Lebanon	
	Area	Seed	Area	Seed	Area	Seed	Area	Seed	Area	Seed
	(Ha)	quantities (Tons)	(Ha)	quantities (Tons)	(Ha)	quantities (Tons)	(Ha)	quantities (Tons)	(Ha)	quantities (Tons)
Green Beans	180.0	15.1	45.0	3.8	3.600.0	302.4	-------	-------	3,550.0	298.2
Cabbages	1,000.0	0.4	-------	-------	-------	-------	-------	-------	3.000.0	1.1
Cucumbers and Gherkins	-------	-------	-------	-------	5.000.0	18.0	-------	-------	6.000.0	21.6
Cantaloupes and Melons	-------	-------	-------	-------	8.000.0	21.1	-------	-------	2.000.0	5.3
Eggplants	-------	-------	-------	-------	6,000.0	4.3	-------	-------	2,000.0	1.4
Tomatoes	7.600.0	5.5	460.0	0.3	18,000.0	13.0	330.0	0.2	10,800.0	7.8
Watermelons	197.0	0.6	35.0	0.1	22.970.0	68.9	195.0	0.6	3.800.0	11.4
Cauliflower	350.0	0.3	65.0	0.1	2.448.0	2.4	100.0	0.1	1.950.0	1.9
Carrots	190.0	1.6	32.0	0.3	-------	-------	75.0	0.6	-------	-------
Strawberries	-------	-------	15.0	1,080.0	-------	-------	-------	-------	-------	-------
Potatoes	210.0	504.0	815.0	1,956.0	25.000.0	60,000.0	-------	-------	-------	-------
Total	**9,727.0**	**527.5**	**1.467.0**	**3,040.5**	**91,018.0**	**430.1**	**700.0**	**1.5**	**33,100.0**	**348.6**

Country / *Crop*	Egypt		Morocco		Tunisia		Turkey		Jordan		Libyan		Yemen	
	Area (Ha)	Seedling quantities (1000)	Area (Ha)	Seedling quantities (1000)	Area (Ha)	Seedling quantities (1000)	Area (Ha)	Seedling quantities (1000)	Area (Ha)	Seedling quantities (1000)	Area (Ha)	Seedling quantities (1000)	Area (Ha)	Seed quantities (1000)
Artichokes	2,300.0	22,080.0	1.860.0	17.856.0	2.700.0	25,920.0	2,100.0	20.160.0	-------	-------	-------	-------	-------	-------
Lettuce	5.800.0	7.0	-------	-------	-------	-------	13.000.0	15.6	811.0	1.0	-------	-------	190.0	0.2
Strawberries	1.800.0	129,600.0	1.000.0	72,000.0	9.0	648.0	8,500.0	612.000.0	-------	-------	-------	-------	-------	-------
Potatoes	113,000.0	271.200.0	66,000.0	158.400.0	22,000.0	52,800.0	225,000.0	540,000.0	4,298.0	10,315.2	18,500.0	44,400.0	-------	-------
Sweet Potatoes	6.420.0	385.200.0	850.0	51,000.0	-------	-------	-------	-------	20.0	1,200.0	-------	-------	15,372.0	36.892.8
Total	**129,320.0**	**808,087.0**	**69,710.0**	**299,256.0**	**24,709.0**	**79,368.0**	**248.600.0**	**1,172,175.6**	**5,129.0**	**11.516.2**	**18,500.0**	**44,400.0**	**15,562.0**	**36,893.0**

Source of Area: FAO 1998 (http://www fao.org) and FAO Year book vol.51, 1997.

All values under seed quantities are estimated based on the statistics of cultivated area.

Annex 3 - Productivity of some vegetable crops in some countries of NENA region

Country	Egypt	Morocco	Tunisia	Turkey	Jordan	Yemen	Libya	U A E	Kuwait	Syrian Arab	Qatar	Lebanon	Average
Crop	Yield (T/Ha)	Yield (T/Ha)	Yield (T/Ha)	Yield (T/Ha)	Yield (T/Ha)	Yield (T/Ha)	Yield (T/Ha)	Yield (T/Ha)	Yield (T/Ha)	Yield (T/Ha)	Yield (T/Ha)	Yield (T/Ha)	Yield (T/Ha)
Artichokes	13.3	13.4	92.6	11.7	-------	-------	-------	-------	-------	-------	-------	-------	32.7
Asparagus	-------	1.3	-------	5.0	-------	-------	-------	-------	-------	-------	-------	-------	3.2
Green Beans	9.8	7.0	6.8	8.3	12.0	5.5	-------	8.3	16.9	9.0	-------	10.6	9.4
Cabbages	25.8	26.7	-------	23.0	24.4	9.2	15.0	-------	-------	-------	-------	-------	20.7
Eggplants	19.3	13.8	-------	26.1	25.0	8.3	14.4	-------	-------	-------	-------	-------	17.8
Cantaloupes and Melons	27.5	16.6	-------	-------	-------		-------	-------	-------	-------	-------	-------	22.1
Okra	0.6	-------	-------	4.3	3.5	6.0	-------	-------	-------	-------	-------	-------	3.6
Lettuce	23.6	-------	-------	17.3	23.4	4.5	-------	-------	-------	-------	-------	-------	17.2
Green Peas	8.7	3.3	-------	5.7	4.6	-------	2.4	-------	-------	-------	-------	-------	5.0
Pumpkins and Squash	17.8	33.3	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	25.6
Spinach	16.3	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	16.3
Strawberries	20.8	10.0	5.6	12.0	-------	-------	-------	-------	19.3	-------	-------	-------	13.5
Tomatoes	34.2	41.6	28.5	41.8	42.6	14.9	14.2	72.4	76.1	26.0	29.1	29.2	37.5
Watermelons	25.4	18.0	11.0	26.7	23.2	12.6	-------	21.0	31.4	11.8	9.7	25.0	19.6
Potatoes	17.7	18.2	13.2	23.6	25.6	12.7	7.3	21.4	39.3	22.1	-------	24.0	20.5
Sweet Potatoes	24.1	21.2	-------	-------	1.5	-------	-------	-------	-------	-------	-------	-------	15.6
Cucumbers and Gherkins	13.9	7.9	-------	28.6	83.3	20.0	29.1	-------	-------	-------	-------	-------	30.5
Cauliflower	22.9	19.8	20.0	18.2	23.1	-------	8.8	25.7	36.9	24.7	12.0	23.1	21.4
Carrots	25.9	21.5	7.3	20.0	20.5	8.5	4.0	21.1	40.6	-------	11.3	-------	18.1

Source: FAO 1998 (http://www.fao.org)

Annex 4 - Total production of some vegetable crops in some countries of NENA region

Country	Egypt	Morocco	Tuoisin	Turkey	Jordan	Yemen	Libya	U A E	Kuwait	Syrian Arab	Qatar	Lebannn	Total
Crop	Production (1000 Ton)	Productioo (1000 Ton)	Productiun (1000 Ton)	Production (1000 Ton)	Production (1000 Ton)	Production (1000 Ton)	Productiun (1000 Too)	Production (1000 Ton)	Production (1000 Tnn)	Productioo (1000 Ton)	Production (1000 Ton)	Production (1000 Ton)	Production (1000 Ton)
Artichokes	30.5	25.0	250.0	24.5	------	------	------	------	------	------	------	------	330.0
Asparagus	------	36.0	------	0.0	------	------	------	------	------	------	------	------	36.0
Green Beans	2,100.0	21.0	2.7	455.0	21.0	9.8	------	1.5	0.8	32.4	------	------	2,644.2
Cabbages	470.0	20.0	------	681.0	28.4	0.8	3.0	------	------	------	------	------	1,203.2
Eggplants	560.0	22.0	------	850.0	70.0	3.3	3.9	------	------	------	------	------	1,509.2
Cantaloupes and Melons	550.0	415.0	------	------	------	0.0	------	------	------	------	------	------	965.0
Okra	7.4	------	------	26.0	2.8	18.0	------	------	------	------	------	------	54.2
Lettuce	137.0	------	------	225.0	19.0	0.9	------	------	------	------	------	------	381.9
Green Peas	135.0	40.0	------	50.0	1.1	------	5.5	------	------	------	------	------	231.6
Pumpkins and Squash	570.0	200.0	------	------	------	------	------	------	------	------	------	------	770.0
Spinach	46.5	------	------	------	------	------	------	------	------	------	------	------	46.5
Strawberries	37.5	10.0	0.0	102.0	------	------	------	------	0.3	------	------	------	149.8
Tomatoes	5,980.0	1,040.0	663.0	6,600.0	640.0	225.2	135.0	550.0	35.0	468.4	9.6	9.6	16,355.8
Watermelons	1,650.0	227.0	296.0	3,600.0	70.0	89.7		4.1	1.1	272.0	1.9	1.9	6,213.8
Potatoes	2,000.0	1,200.0	290.0	5,300.0	110.0	195.6	135.0	4.5	32.0	552.6	------	------	9,819.7
Sweet Potatoes	155.0	18.0	------	------	0.0	------	------	------	------	------	------	------	173.0
Cucumbers and Gherkins	258.0	26.0	------	1,400.0	125.0	12.0	16.0	------	------	------	------	------	1,837.0
Cauliflower	110.0	47.5	7.2	89.0	46.0	------	3.5	9.0	2.4	60.4	1.2	1.2	377.4
Carrots	110.0	228.0	40.0	220.0	11.6	7.1	22.0	4.0	1.3	------	0.8	0.8	645.6

Annex 5 - Area of vegetable crops under protected cultivation and estimation of seedlings inputs in some countries of NENA region

Crop	Pepper		Strawberries		Tomatoes		Cucumbers		Cantaloupes and Water Melons		Green Beans		Eggplants	
Country	Area (Ha)	Seedling quantities (1000)	Area (Ha)	Seedling quantities (1000)	Area (Ha)	Seedling quantities (1000)	Area (Ha)	Seedling quantities (1000)	Area (Ha)	Seedling quantities (1000)	Area (Ha)	Seedling quantities (1000)	Area (Ha)	Seedling quantities (1000)
Turkey	2,748.0	65,952.0	-------		7,538.0	180,912.0	3,852.0	92,448.0	13,429.0	322,296.0	------		2,403.0	57,672.0
Egypt	2,948 4	69,374.1	-------	-------	3.061.8	72,042.4	3,628.8	85,383.5	1,701.0	40,023.5	-------	-------	-------	-------
Morocco	1,540.0	36,235.3	1,925.0	45,294.1	1,925.0	45,294.1	1,540.0	36,235.3	770.0	18,117.6	-------	-------	-------	-------
Libya	400.0	9,411.8	-------	-------	600.0	14,117.6	800.0	18,823.5	100.0	2,352.9	-------	-------	100.0	2,352.9
Jordan	229.6	5,402.4	-------	-------	126.3	2,971.3	719.8	16,936.4	-------	-------	70.0	1,647.7	-------	-------
Lebanoo	14.3	335.9	-------	-------	362.3	8,525.6	148.2	3,487.8	-------	-------	12.1	284.2	12.0	282.9
Syria	350.4	8,245.8	-------	-------	1,206.5	28,387.1	344.7	8,110.6	-------	-------	-------	-------	12.6	297.4
Kuwait	20.0	470.6	-------	-------	120.0	2,823.5	240	5,647.1	-------	-------	8.0	188.2	12.0	282.4
U A E	39.2	922.4	-------	-------	19.6	461.2	117.6	2,767.1	-------	-------	19.6	461.2	-------	-------
Qatar	1.4	33.1	-------	-------	3.3	76.8	58.9	1,385 4	-------	-------	-------	-------	-------	-------
Total	**8,291.3**	**196,383.4**	**1,925.0**	**45,294.1**	**14,962.8**	**327,224.5**	**11,450.0**	**271,224.7**	**16,000.0**	**382,790.5**	**109.706**	**2,581.3**	**2,539.6**	**60,887.0**
Est. seed (ton)	-------	1.50	-------		-------	1.45	-------	9.04	-------	15.31	-------	0.68	-------	0.470

Source of area: Protected cultivation in Arab region, in protected agriculture (1997). ICARDA

All value under seedling quantities are estimated based on the statistics of cultivated area.

Annex 6 - Area of vegetable crops and estimation of seeds inputs in some countries of NENA region*

Crop / Country	Tomatoes		Watermelons and Melons		Cucumbers and Gherkins		Cabbage & Cauliflower		Green Pea		Eggplant	
	Area (Ha)	Seed quantities (Tons)	Area (Ha)	Seed quantities (Tons)	Area (Ha)	Seed quantities (Tons)	Area (Ha)	Seed quantities (Tons)	Area (Ha)	Seed quantities (Tons)	Area (Ha)	Seed quantities (Tons)
Egypt	154,050.00	110.92	51,500.00	148.32	23,623.00	85.04	16,556.00	10.93	15,826.00	1,519.30	20,638.00	14.86
Morocco	19,980.00	14.39	31,420.00	90.49	3,260.00	11.74	2,320.00	1.53	11,260.00	1,080.96	1,800.00	1.30
Libya	8,200.00	5.90	13,800.00	39.74	660.00	2.38	554.00	0.37	3,754.00	360.38	3,270.00	2.35
Jordan	13,900.00	10.01	5,200.00	14.98	1,840.00	6.62	2,760.00	1.82	82.00	7.87	2,058.00	1.48
Lebanon	12,600.00	9.07	4,300.00	12.38	5,898.00	21.23	3,662.00	2.42	1,054.00	101.18	2,802.00	2.02
Syria	20,900.00	15.05	38,200.00	110.02	14,330.00	51.59	5,090.00	3.36	2,024.00	194.30	5,842.00	4.21
Kuwait	300.00	0.22	50.00	0.14	242.00	0.87	42.00	0.03	-------	-------	96.00	0.07
U A E	4,400.00	3.17	814.00	2.34	214.00	0.77	2,136.00	1.41	-------	-------	970.00	0.70
Qatar	300.00	0.22	386.00	1.11	222.00	0.80	210.00	0.14	-------	-------	142.00	0.10
Tunisia	22,140.00	15.94	34,340.00	98.90	-------	-------	254.00	0.17	11,806.00	1,133.38	-------	-------
Yemen	12,500.00	9.00	10,600.00	30.53	538.00	1.94	104.00	0.07	-------	-------	366.00	0.26
Total	**269,270.00**	**193.87**	**190,610.00**	**548.96**	**50,827.00**	**182.98**	**33,688.00**	**22.23**	**45,806.00**	**4,397.38**	**37,984.00**	**27.35**
Quantities of seeds (Kg/Ha)		0.72		2.88		3.6		0.66		96		0.72

*Source of Area: Arab Organization For Agricultural Development (Statistics Yearbook), 17,Dec., 1997.

Annex 7 - Area of vegetable crops and estimation of seeds and seedlings inputs in Egypt from 1991 to 1996

1a-Seeds

Crops	1991		1992		1993		1994		1995		1996	
	Area Ha	Seed quantities (Tons)	Area Ha	Seed quantities (Tons)	Area Ha	Seed quantities (Tons)	Area Ha	Seed quantities (Tons)	Area Ha	Seed quantities (Tons)	Area Ha	Seed quantities (Tons)
Tomato	136,666.67	98.40	150,833.33	108.60	146,250.00	105.30	141,250.00	101.70	147,916.67	106.50	171,666.67	123.60
Squash	22,083.33	79.50	20,416.67	73.50	23,750.00	85.50	27,083.33	97.50	25,833.33	93.00	27,500.00	99.00
Green Bean	13,333.33	1,120.00	12,500.00	1,050.00	14,166.67	1,190.00	15,416.67	1,295.00	16,666.67	1,400.00	20,416.67	1,715.00
Dry Bean	12,083.33	1,015.00	9,583.33	805.00	6,666.67	560.00	7,500.00	630.00	8,750.00	735.00	9,166.67	770.00
Green Cowpea	1,666.67	160.00	2,083.33	200.00	1,666.67	160.00	4,166.67	400.00	5,416.67	520.00	4,583.33	440.00
Dry Cawpea	5,000.00	480.00	2,083.33	200.00	3,333.33	320.00	5,000.00	480.00	6,250.00	600.00	4,166.67	400.00
Green Peas	9,166.67	880.00	17,500.00	1,680.00	18,750.00	1,800.00	10,416.67	1,000.00	20,833.33	2,000.00	11,250.00	1,080.00
Dry Peas	416.67	40.00	1,250.00	120.00	833.33	80.00	12,916.67	1,240.00	416.67	40.00	9,166.67	880.00
Cabbage	15,000.00	18.00	15,416.67	18.50	15,416.67	18.50	17,500.00	21.00	17,083.33	20.50	16,250.00	19.50
Cauliflower	3,750.00	3.60	4,166.67	4.00	4,166.67	4.00	4,583.33	4.40	5,000.00	4.80	4,583.33	4.40
Eggplant	18,750.00	13.50	16,666.67	12.00	20,833.33	15.00	20,416.67	14.70	18,750.00	13.50	25,000.00	18.00
Pepper	17,083.33	10.25	15,000.00	9.00	18,333.33	11.00	16,666.67	10.00	17,083.33	10.25	22,500.00	13.50
Okra	5,000.00	120.00	5,000.00	120.00	5,000.00	120.00	5,000.00	120.00	5,416.67	130.00	5,416.67	130.00
Jews mallow	3,333.33	72.00	4,166.67	90.00	4,583.33	99.00	4,166.67	90.00	3,750.00	81.00	3,750.00	81.00
Spinach	2,500.00	60.00	2,083.33	50.00	2,083.33	50.00	2,500.00	60.00	2,916.67	70.00	2,500.00	60.00
Egyptian mallow	416.67	50.00	416.67	50.00	416.67	50.00	416.67	50.00	416.67	50.00	416.67	50.00
Radish	833.33	14.00	1,250.00	21.00	1,666.67	28.00	1,250.00	21.00	833.33	14.00	833.33	14.00
Tomato	136,666.67	98.40	150,833.33	108.60	146,250.00	105.30	141,250.00	101.70	147,916.67	106.50	171,666.67	123.60
Turnip	2,500.00	18.00	2,500.00	18.00	2,083.33	15.00	2,083.33	15.00	2,916.67	21.00	2,500.00	18.00
Lettuce	5,416.67	6.50	5,416.67	6.50	5,416.67	6.50	5,416.67	6.50	5,000.00	6.00	5,416.67	6.50
Carrot	3,750.00	36.00	3,333.33	32.00	4,166.67	40.00	4,166.67	40.00	4,583.33	44.00	4,166.67	40.00
Parsley	2,083.33	50.00	1,666.67	40.00	1,666.67	40.00	1,666.67	40.00	1,666.67	40.00	1,666.67	40.00
Rocket	2,083.33	20.00	2,083.33	20.00	2,083.33	20.00	1,666.67	16.00	1,666.67	16.00	1,250.00	12.00
Egyptian leek	833.33	44.00	833.33	44.00	833.33	44.00	833.33	44.00	833.33	44.00	833.33	44.00
Local melon	3,333.33	10.00	2,916.67	8.75	2,500.00	7.50	8,750.00	26.25	7,500.00	22.50	7,916.67	23.75
Melon	14,166.67	51.00	11,666.67	42.00	10,000.00	36.00	6,666.67	24.00	8,333.33	30.00	11,250.00	40.50
Cantaloupe	7,500.00	27.00	5,833.33	21.00	15,000.00	54.00	17,916.67	64.50	10,416.67	37.50	12,916.67	46.50
Cucumber	15,416.67	55.50	15,833.33	57.00	18,750.00	67.50	17,083.33	61.50	18,333.33	66.00	23,333.33	84.00
Snake cucumber	3,333.33	6.00	3,333.33	6.00	5,000.00	9.00	3,750.00	6.75	6,250.00	11.25	5,000.00	9.00
Total 1a & 1b	327,500	4558.00	335,833	4907.00	355,417	5036.00	366,250	5979.75	370,833	6227.25	415,417	6262.25

1b-Seedlings

Crops	1991		1992		1993		1994		1995		1996	
	Area Ha	Seedling quantities (1000)	Area Ha	Seedling quantities (1000)	Area Ha	Seedling quantities (1000)	Area Ha	Seedling quaotities (1000)	Area Ha	Seedling quantities (1000)	Area Ha	Seedling quantities (1000)
****Potato**	87,500.00	157,500.00	69,166.60	124,499.88	55,000.00	99,000.00	64,166.60	115,499.88	82,500.00	148,500.00	95,000.00	171,000.00
Sweet potato	4,583.33	275,000.00	3,750.00	225,000.00	5,416.67	325,000.00	6,250.00	375,000.00	5,000.00	300,000.00	6,250.00	375,000.00
Artichoke	2,500.00	24,000.00	2,083.33	20,000.00	2,083.33	20,000.00	1,250.00	12,000.00	2,083.33	20,000.00	2,083.33	20,000.00
Strawberry	2,083.33	150,000.00	1,666.67	120,000.00	1,666.67	120,000.00	1,666.67	120,000.00	1,666.67	120,000.00	1,666.67	120,000.00
Total	**96,667**	**606,500**	**76,667**	**489,500**	**64,167**	**564,000**	**73,333**	**622,500**	**91,250**	**588,500**	**105,000**	**686,000**

****Tubers (Ton)**

*** *Source of Area:* Statistical Yearbook- Central Agency for Public mobilizatioo and Statistics, ARE, 19998**

Annex 8: Quantity and value of vegetable seeds in Egypt for a period from 1987 to 1991

Year	1987		1988		1989		1990		1991	
Crops	Quantity	Price 1000 L.E	Quantity	Price 1000 L.E	Quantity	Price 1000 L.E	Quantity	Price 1000 L.E	Quantity	Price 1000 L.E
Potato (ton)	201,993.0	94,704.0	211,384.0	98,612.0	167,512.0	119,598.0	201,766.0	193,121.0	191,902.0	208,836.0
Tomato (k/g)	90,200.0	108,240.0	90,343.0	117,449.0	95,616.0	133,864.0	92,744.0	14,839.0	73,797.0	12,619.0
Squash (k/g)	96,880.0	7,750.0	97,218.0	971.0	87,852.0	1,055.0	89,721.0	1,346.0	92,763.0	1,484.0
Bean (k/g)	2,393,600.0	4,787.0	2,007,640.0	6,023.0	1,859,360.0	7,437.0	2,084,760.0	10,423.0	2,461,320.0	14,768.0
Cow pea (k/g)	384,360.0	576.0	417,270.0	1,044.0	275,430.0	824.0	321,990.0	1,128.0	458,190.0	1,833.0
Cabbage (k/g)	8,950.0	716.0	9,680.0	968.0	8,401.0	877.0	8,776.0	1,226.0	9,028.0	144.0
Eggplant (k/g)	10,640.0	1,277.0	10,050.0	1,408.0	9,964.0	1,590.0	10,285.0	1,851.0	11,344.0	2,189.0
Pepper (k/g)	7,929.0	1,427.0	8,206.0	1,477.0	8,174.0	1,798.0	8,584.0	2,146.0	9,113.0	2,442.0
Okra (k/g)	34,343.0	172.0	32,585.0	162.0	30,937.0	185.0	35,363.0	283.0	37,820.0	340.0
Cauliflower (k/g)	2,080.0	250.0	1,938.0	272.0	1,533.0	213.0	1,902.0	304.0	1,841.0	315.0
Peas (k/g)	854,385.0	3,408.0	977,690.0	2,932.0	925,680.0	4,628.0	880,320.0	5,282.0	793,905.0	5,557.0
Spinach (k/g)	17,216.0	52.0	7,082.0	21.0	10,922.0	44.0	11,992.0	48.0	11,978.0	48.0
Jews mallow (k/g)	17,633.0	53.0	17,906.0	71.0	12,337.0	50.0	9.295.0	28.0	10,473.0	63.0
Radish (k/g)	4,977.0	25.0	5,447.0	27.0	9,187.0	56.0	4,764.0	28.0	4,036.0	26.0
Carrot (k/g)	35,853.0	896.0	31,602.0	948.0	29,463.0	1,031.0	19,944.0	798.0	31,808.0	1,368.0
Turnip (k/g)	21,909.0	66.0	24,504.0	73.0	18,207.0	63.0	18,141.0	73.0	18,969.0	76.0
Lettuce (k/g)	7,020.0	105.0	6,770.0	115.0	5,979.0	120.0	6,627.0	146.0	6,559.0	157.0
Parsley (k/g)	3,460.0	15.0	3,917.0	19.0	4,378.0	24.0	3,704.0	22.0	4.975.0	32.0
Rocket (k/g)	16,325.0	73.0	8,917.0	44.0	9,587.0	53.0	21,862.0	131.0	7,312.0	48.0
Water melon (k/g)	254,107.0	3,812.0	250,940.0	5,019.0	238,487.0	3,815.0	235,172.0	7,055.0	203,846.0	6,523.0
Melon (k/g)	31,821.0	796.0	54,604.0	1,365.0	53,553.0	1,606.0	35,487.0	1,419.0	40,024.0	1,721.0
Cucumber (k/g)	53,778.0	1,076.0	47,206.0	1,182.0	50,773.0	1,777.0	42,926.0	1,502.0	46,241.0	1,988.0
Cantaloupe (k/g)	1,222.0	41.0	19,137.0	618.0	11,617.0	676.0	9,316.0	324.0	10,639.0	640.0
Snake cucumber (k/g)	8,590.0	214.0	7,298.0	218.0	8,082.0	283.0	6,624.0	265.0	9,403.0	404.0
Celery (k/g)	-	-	7.0	-	10.0	-	9.0	-	6.0	-
Broad bean (k/g)	16,800.0	50.0	-	-	6,200.0	19.0	850.0	2.0	-	-
Sweet potato (1000/ctg)	84,325.0	84.0	277,000.0	333.0	130,175.0	215.0	173,625.0	313.0	280,550.0	539.0
Artichoke (k/g)	23,488.0	2,819.0	22,508.0	788.0	29,920.0	1,272.0	29,036.0	1,452.0	25,296.0	1,353.0
Taro (ton)	7,943.0	3,972.0	7,085,100.0	4,474.0	9,804.0	8,257.0	6,952.0	3,659.0	8,043.0	4,529.0
Egyptian leek (ton)	27,577.0	221.0	23,037.0	184.0	46,882.0	422.0	20,706.0	167.0	6,966.0	187.0

Crops / Year	1987		1988		1989		1990		1991	
	Quantity	Price 1000 L.E	Quantity	Price 1000 L.E	Quantity	Price 1000 L.E	Quantity	Price 1000 L.E	Quantity	Price 1000 L.E
Strawberry (k/g)	59,780.0	9,565.0	77,260.0	10,044.0	82,920.0	10,780.0	125,440.0	17,562.0	93,360.0	18,952.0
Garlic (ton)	2,929.0	1,464.0	2,772.0	2,772.0	1,811.0	2,264.0	1,848.0	2,772.0	3,251.0	6,503.0
Others (k/g)	3,201.0	19.0	1,447.0	9.0	3,252.0	63.0	21,024.0	650.0	4.800.0	646.0
Total		**248,706.0**		**259,633.0**		**304,896.0**		**269,715.0**		**295,684.0**
Local production of vegetable seeds (1000 L.E)	**55,818.0**		**59,236.0**		**68,429.0**		**58,745.0**		**65,784.0**	

Source: Agricultural Research Center Publication Egypt. 1993

Copyrighted material

FORAGE AND PASTURE SEED PRODUCTION AND SUPPLY IN THE NEAR EAST AND NORTH AFRICA[10]

Mohammed TAZI
Chef du Centre de Production des Semences Pastorales, B.P. 79 El Jadida, Maroc

1. INTRODUCTION

The Near East and North Africa region (as defined by FAO) includes the following 31 countries: Afghanistan, Algeria, Azerbaijan, Bahrain, Cyprus, Djibouti, Egypt, Iran, Iraq, Jordan, Kuwait Kyrgyz Republic. Lebanon, Libya, Malta, Mauritania, Morocco, Oman, Pakistan, Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tajikistan, Tunisia, Turkey, Turkmenistan, United Arab Emirates (UAE) and Yemen.

Climates of the region vary from sub-humid (> 120-day growing period) to quite arid (< 75-Day growing period). Most countries have a Mediterranean type climate characterised by a short, mild winter and a hot dry summer separated by a short autumn and spring. The monsoonal Near East region is characterised by a hot climate and rainy summers.

Of the 1,852 million ha total land area, 27.9% is permanent pastures, 6.7% is occupied by forests and 7.2% is arable land (World Resources Institute, 1994). Only 30% of the arable land is irrigated. This shows that agriculture is very dependent on climatic factors. Most of the remaining land surface is classified as waste and barren land of which one third is suitable for intensive and reliable livestock production, which provides significant feed resources for nomadic and transhumant livestock populations (Sidahmed 1991)

The extent to which land is used for permanent pastures, cultivated forage land and rangeland indicates a reasonable potential for intensive livestock production. Raising livestock is an important traditional activity of nomadic, transhumant, and settled rural communities in the region. Rangelands also constitute a source of energy for farming populations, especially during the period of low temperatures.

Due to a general increase in livestock populations and feed shortages, and in order to combat rangeland desertification, several member countries have initiated programmes to increase forage production and to improve dry season feed quality and soil stabilisation. These programmes are designed to enrich the plant cover by seeding or planting of adapted pastoral species. Such programmes include the introduction of fodder species in crop rotations, the improvement of rangeland by seeding with selected grasses and legumes and planting adaptable fodder trees and shrubs, and the utilisation of marginal fallow land to establish self-regenerating pasture (Tazi, 1995; Zaroug, 1988). The success of these operations depends on several factors among which one of the key elements is the availability of large enough quantities of good quality seeds.

---

[10] Additional data on forage and pasture seed production in the NENA region is presented in annexes 1-2

2. PRESENT STATUS OF FORAGE AND PASTURE SEED PRODUCTION

2.1 Forage Germplasm Utilisation and Crop Improvement

The Near East and North Africa region is considered as one of the most important centres of diversity for several forage species. Germplasm collection has been undertaken by international scientists and institutions since the beginning of the century. During the last decade, national programmes in several countries have paid great attention to collecting plant genetic resources, especially for forage crop species. In the Maghreb countries, which include Algeria, Libya, Morocco and Tunisia, herbaceous species are the most collected (FAO, 1996) plant species. Collecting activities have been mainly conducted by national institutions in collaboration with international centres and institutes such as IBPGR (IPGRI), ICARDA and institutions from developed countries such as the USA, Great Britain, Canada, France and Australia. At ICARDA, 24% of the conserved germplasm is comprised of forage species, of which 66% are from West Asia and the North Africa region (Table 1).

Table 1. Origin of ICARDA collections (December 1993).

	Origin of accessions				
	WANA		Other countries		Total
Crop	Number	%	Number	%	Number
Cereals	**32 545**	**63.6**	**18 609**	**36.4**	**51 154**
Barley	9 233	44.0	11 735	56.0	20 968
Wild Hordeum	1 391	90.3	149	9.7	1 540
Durum Wheat	12 222	68.9		31.2	17 751
Bread Wheat	6 665	93.2	486	6.8	7 151
Other *Triticum*	1 248	87.3	182	12.7	1 430
Aegilops	1 786	77.2	528	22.8	2 314
Food Legumes	**12 894**	**64.8**	**7 009**	**35.2**	**19 903**
Chickpea	6 700	78.9	1 795	21.1	8 495
Wild *Cicer*	263	97.0	8	3.0	271.
Lentil	3 988	55.2	3 240	44.8	7 228
Wild *Lens*	315	81.6	71	18.4	386
Faba Bean	1 628	46.2	1 895	53.8	3 523
Forages	**14 644**	**65.7**	**7 652**	**34.3**	**22 296**
Medicago	5 791	79.9	1 460	20.1	7 251
Vicia	2 247	48.8	2 357	51.2	4 604
Pisum	467	13.7	2 951	86.3	3 418
Lathyrus	1 180	83.3	237	16.7	1 417
Trifolium	2 741	95.4	131	4.6	27 872
Other genera	**2 218**	**81.1**	**516**	**18.9**	**2 734**
Grand Total	**60 083**	**64.4**	**33 270**	**35.7**	**93 353**

Source: FAO 1996

Forage germplasm from the region has been widely used in breeding programmes around the world. Several traits and characters including high yielding, disease and insect resistance and cold or drought tolerance serve as the basis of crop improvement in these programmes. A good example is local ecotypes

Copyrighted material

of forages from North Africa that have been used at an international level to produce commercial cultivars such as Berber, Ichkhel and Kasba of *Dactylis glomerata*; El Golea, Sirocco and Soukra of *Phalaris aquatica;* Djbeniana, Grombalia, Maris Jebel, Maris Kasba and Mornag of *Festuca arundinacea*, Demnat and Gabes of *Medicago sativa*, Rivoli of *Medicago tornata*, El Gara of *Ornithopus compressus* and Jebala of *Ornithopus pinnatus*. (FAO, 1996).

In most countries, breeding, evaluation and variety development are implemented through the breeding and selection programmes within research institutions and universities. Some private companies have also been involved in Morocco, Pakistan Turkey and Jordan. These activities are particularly focused on cash crops. The leading breeding programmes in all countries are the National Agricultural Research Centres or Institutes. With the collaboration of the CGIAR centres, national breeding programmes within the region have made a great effort to improve germplasm collections and to enhance germplasm evaluation and utilisation, particularly for cereals, food legumes and sometimes for forage crops. (FAO, 1996). Variety development is carried out on alfalfa, berseem clover, oat, vetch, medics, fodder peas and fodder barley (Table 2).

Table 2. Forage and pasture varieties recently developed by some countries in the Near East and North Africa

Species	Variety	Country
Alfalfa	African, Maopa, Sonora	Morocco
	5 varieties	Iran
Annual medics	Bariya (CPSP00097), Haouzia (CPSP00097), Mettouh (CPSP0148), Jabilia (INDAI), Badrya (V124), Karama (V384)	Morocco
Oat	Karia, Taza (320), Tedders (412), Zhiliga (095), Paras (Cokfr79-17), Ghali (Il 3411), Soualem (Mo 06423), Rahma (C7512cpx), Tislit (83 Ab3101), Zahri (72 Ab3082), Tissir (87wiqr157-5), Amlal (87 Wi 8202-03), Nasr (88 M 1420)	Morocco
	Mulga	Algeria
Berseem clover	Sakka 3, Giza 6, Giza 10	Egypt
Sudan grass	S-S Grass Hybrid 102, 402, 103, 407	Egypt
Fodder millet	S-17 Hybrid	Egypt
Fodder barley	Lysi, Sanokrithi 94	Cyprus
Fodder peas	Alfia5 (F305), Alfia17 (F317), Alfia21 (F321)	Morocco
Vetch	Ghazza (6194), Guich1 (6242), Hallaba (6238), Nawal (6235), Nora (6194), Salholtma (1812), Hesba (Acc573), Marhaba (Acc577), Yamama (Acc7o9)	Morocco
	Achilleas	Cyprus

2.2 Forage and Pasture Seed Production and Supply

The area cultivated with forage crops varies from one country to the other. The most important forage crops produced in the region are alfalfa, berseem clover, barley and sorghum under irrigation and oat, vetch, barley, ray-grass, fodder peas, sainfoin, annual medic, clover and *Hedysarum* in the rainfed zones. For rangeland improvement, species used include perennial grasses (*Dactylis, Festuca, Agropyron*, etc.), annual medics, clovers and fodder shrubs *(Acacia, Atriplex*, etc.).

In general, the assessment of forage and pasture seed needs is very difficult due to the fluctuation of the amount of informal seed used by farmers and to the lack of precise information related to the subject. Table 3 shows the areas that are cultivated with forage crops, the seed requirements, seed production, and seed importation for some countries.

The seed production in the region is highly dependent on the amount and distribution of rains within the year. Therefore, in each country, seed needs are covered either through national production or through importation. In general, seed import constitutes a solution for deficits in forage and pasture seeds, particularly during dry years.

Although, most countries have developed facilities for variety improvement and testing, research on forage species are still limited. Because the majority of farmers are saving their own seed or exchanging it with other farmers in the community, large areas are still cultivated with traditional varieties. These practices are due to the fact that cultivated forage crop seeds are considered a by-product and that the informal sector is still playing a leading role in seed exchange.

Table 3. Forage areas, seed requirements and seed production in some countries from the Near East and North Africa.

Country	Forage Areas (ha)	Seed Requirements (tons)	Formal Seed Production (tons)	Seed Imports (tons)	Period	Data Source
Cyprus	14 000	-	202	48	1994-1995	Xenophontos, E. 1997 FAO, 1996
Morocco	395 000	27 661	1 300	-	1990-1994	Tahiri, A., M. Bouchrifa, M., Tazi, and A. Lahlou. 1997
Tunisia	281 909	26 175		5054	1992-96	Chouki, S. 1997
Sudan	-	-	-	227	1990-91	Yousef, O.,A., F. and M., H., Ali. 1994
Iran			1 500		1995	Anonymous. 1995
Saudi Arabia	220 000			2162	1986	Al-Braheem, S., M. 1989
Turkey	549 000	40 000	1 749	305	1995	Balıkcioglu, T.T. 1996
Yemen	79 568	2049			1996	Al-Tashi, K., M., H. 1996

It should be emphasised that only a few countries such as Morocco, Saudi Arabia and to some extent Tunisia, Syria, and Jordan, have initiated range seed production. This is undertaken by public institutions such as Livestock and Forestry Departments; seeds are produced either at specialised centres or collected from protected areas. However, the quantities produced by each country do not exceed 50 tons/year (Tazi, 1995).

Forage seed supply in the Near East and North Africa is generally provided through two main channels, which include the formal seed sector (controlled local production and imports) and own-saved seed. Formal seed production and distribution is carried out for the most part by the public sector, but private companies are also involved especially in Turkey, Jordan, Morocco, Tunisia, Lebanon and Pakistan. However, these private companies are mainly active in marketing imported seeds of some selected forage crops (alfalfa, sorghum). The certified seed procurement and distribution programme is based on local production, imports and available stocks. Examples of seed distribution systems from the region are described below.

In Cyprus, the marketing of forage seed is carried out by the Seed Production Centre (SPC) through Village Cooperative Credit Societies (VCCS), which provide farmers with the necessary credit for seed purchases. Seed marketing and distribution of forage seed follow a specific procedure. Before each growing season, a catalogue of available seeds is sent by the SPC to all VCCS to assess farmer's seed requirements. Certain forage seeds are sold directly from the centre or through the district agricultural offices to interested farmers or seed dealers (Xenophontos, 1997).

In Iran, the main marketing and distribution agency is the Agricultural Support Services Company in Teheran.

In Morocco, forage seed marketing and distribution is carried out by the National Society for Seed Commercialisation (SONACOS). Some pasture seeds are also distributed to the range projects by the Pastoral Seed Production Centre (CPSP at El Jadida) (Tazi, 1997).

In Syria, forage seed is marketed through the General Organisation for Livestock, which has branches throughout the country (Madaratti and Sayed, 1995).

In Tunisia, since the demand for forage seed is low and highly concentrated, users buy directly from the seed enterprises. The main public enterprise dealing with forage seeds is GRAFOUPAST (Chouki, 1997).

In Turkey, forage seed produced by the public sector is marketed either directly by the producers or by agricultural credit co-operatives. The private sector markets their produce through agents. In 1995, 50% of fodder seed was distributed by the private sector (Balikcioglu, 1996).

In Yemen, seed distribution is carried out by the National Seed Company through its seed centres as well as through agricultural offices and extension agencies. However, farmer's own seed and farmer to farmer diffusion continue to play an important role (Al-Tashi, 1996).

2.3 Variety Release Seed Legislation and Seed Quality Control

Most countries have enacted measures such as quarantine and seed certification legislation to control plant material importation and exportation. Seed legislation is presented in two forms: seed laws or legislative acts and seed regulations or ministerial decrees. On the other hand, to this point, none of the countries from the region have established variety protection or plant breeder's rights. However, due to the importance of variety protection on variety development and in order to motivate the private sector to invest in seed production, several countries such as Morocco, Tunisia, and Turkey are developing laws to became members of UPOV (State of the world, 1995).

In general, variety release procedures in the region are mainly based on distinctness, uniformity and stability of the new variety and, in some countries, on suitability for commercial production. The new variety has to be tested for at least two to three growing seasons at different locations before being released.

In Cyprus, existing seed laws do not include regulations for variety release and registration. The release of new varieties is decided by a Seed Committee within the Department of Agriculture. Cyprus has also joined the Herbage and Vegetable Seed Certification Schemes of OECD. The seed production branch of the Agronomy Section of the Department of Agriculture is responsible for seed certification. All seed testing is conducted at the SPC laboratory according to the ISTA rules (Xenophontos, 1997).

In Egypt, the law No. 53 of 1966 regulates production and distribution of all field crops. The Central Administration for Seed Testing and Certification is in charge of seed law enforcement. All seeds are subject to inspection during marketing and distribution whether certified or not. Three main seed testing stations at Giza, Tanta and Minia perform laboratory analysis in accordance with ISTA Rules (Abd El-Wanis, 1995).

In Iran, the Seed and Plant Improvement Institute is responsible for variety evaluation, registration and introduction. There is an Official Release Committee composed of heads of research institutes. There is a seed law in preparation, but there is no seed law currently being used. The responsible organisation for seed quality control is the Seed Production and Control Division of the Seed and Plant Improvement Institute in Karaj. ISTA rules are followed for seed testing (Anonymous, 1995).

In Lebanon, seed quality control is shared by various public institutions including the Agricultural Research Institute (ARI), the Ministry of Agriculture (MOA) and the Office of Cereals and Sugar Beets (OCBS). Seed testing facilities are available at ARI and the American University of Beirut. Seed analyses are conducted following official procedures. At present, there is no work conducted on forage crops (Abi Antoun, 1997).

In Libya, no national authority is responsible for the planning and production of seed. In addition, there lacks a certification agency and seed testing laboratory (Zentani, A. 1995).

In Morocco, new varieties are registered by decree by the Ministry of Agriculture and Rural Development and Fisheries on the proposal of the National Committee for Seed and Planting Materials Selection. The official institution in charge of variety release and registration in the Official Catalogue and seed quality control and certification is The Seed and Planting Materials Monitoring Service within the Direction of Plant Protection (DPVCTRF/SCSP). Laboratory checks on seed quality are conform to ISTA rules, and technical regulations governing control and certification are in accordance with OECD rules (Tourkmani, 1994).

In Sudan, the Technical Committee for Crop Variety Release is formulated by a ministerial decree in accordance with the Sudan Seed Law of 1990 and composed of research scientists, seed specialists, crop producers and agricultural administrators. The National Seed Administration (NSA) within the Ministry of Agriculture is responsible for maintaining and multiplying newly released varieties as well as implementing seed certification programmes (Yousef and Ali, 1994).

In Syria, variety testing is conducted by the Directorate of Agriculture and Scientific Research (DASR) or through joint activities with ACSAD and ICARDA. Locally developed or introduced varieties are tested in yield and verification trials and compared with well-adapted commercial varieties in different agro-ecological zones. If a variety shows better value for cultivation and use, the National Release Committee advise the Ministry of Agriculture and Agrarian Reform (MAAR) to release it. After the official release of a variety, the research programs provide the breeder seed to the General Organisation for Seed Multiplication (GOSM) to start initial seed multiplication. The GOSM is responsible for field inspection and seed quality control (Madaratti and Sayed, 1995).

In Tunisia, the seed sector is regulated by legislation enacted in 1976. The law has established a framework for the organisation and control of seed and planting material production and marketing. Seed of all newly released varieties is only authorised for marketing after it has been tested and included in the official catalogue. Since there is no specialised agency, variety evaluation is currently handled by breeders from the Agricultural Research Institute (INRAT). The seed legislation applies the basic philosophy of truth-in-labelling, which is generally enforced by inspection and testing. All seed control analyses are performed according to the ISTA rules. At present, few work is conducted on forage crops (Bouziri, 1997).

In Turkey, seed sector activities and seed quality control are carried out within the framework of Law No 308 and associated regulations enforced in 1963 concerning registration, control and seed certification. Variety development is carried out on alfalfa, sainfoin and vetch. The Seed Registration and Certification Centre (SRCC) is responsible for variety trial (VCU) and DUS tests. It is also responsible for field inspection of seed for export. The Control and Plant Protection Units of the Provincial Directorates of Agriculture are responsible for field inspections in the country.

In Yemen, the Agricultural Research and Extension Authority (AREA) is the main institution responsible for variety development and testing. Newly developed varieties are submitted to the Variety Release Committee for evaluation, release and approval. In both the northern and the southern governorates the existing seed quality control is internal. There is no external seed quality control activity, and no seed laws and regulations to support seed certification (Al-Tashi, 1996).

3. CONSTRAINTS TO FORAGE AND PASTURE SEED PRODUCTION

The forage and pastoral seed sector is faced with several constraints, which can be divided in two categories:

- Specific constraints to the seed sector.
- Inherent constraints to the development of range improvement activities.

3.1 Seed Sector Constraints

The development of the production of forage and pastoral seeds faces a certain number of limiting factors and technical difficulties that are summarised below:

3.1.1 Lack of adapted species and varieties

Introduced forage and pasture species and varieties in the region have appeared, on many occasions, to not be adapted to the local environment. Several countries are lacking organised programmes for breeding and releasing forage varieties. Even in countries where some forage crop improvement programmes have been undertaken, initial seed multiplication remains one of the bottlenecks for improved variety development (Tazi, 1995). Furthermore, breeding objectives do not usually correspond with the needs of farmers.

3.1.2 Constraints to the evaluation of seed requirement

Forage seed supply is impaired by the lack of a realistic seed demand forecast system and late distribution. In fact, seed production in the region is highly dependent on the amount and the distribution of rains within the year. Therefore, seed requirements fluctuate from year to year. In addition, the use of farmer's own seed and farmer-to-farmer exchange reduces the actual demand of certified seed.

3.1.3 Absence of legislation for pasture seed

Up until now, in many countries no certification legislation has been instituted for forage and pasture species. This hinders the development of varieties for these species. Even in countries with seed laws, the certification rules that have been established are sometimes constraining anddo not take into account the means and techniques used by farmers.

3.1.4 Research deficiency

Despite efforts by different researchers and scientists during the last years in the fields of forage crops in general and range improvement in particular, research in the area of forage and pastoral seed production is almost lacking in the region. Furthermore, due to insufficient funds allocated to research and the limited number of specialists working in this area the development of the seed sector as a whole in the region is constrained.

3.1.5 Lack of farmer's interest and private sector involvement

The seed production of pasture and range species by farmers and private companies is non-existent. A lack of farmer's interest is observed even for the certified seed production of other forage species for which the demand is important. This can be explained by the fact that prices that are paid to forage seed producers are not competitive compared to some other remunerative crops. Moreover, it is necessary to underline the lack of specific equipment for seed production and the lack of efficiency of technical support of these farmers, which translates into low yield levels.

3.1.6 Inefficiency of extension and promotion

Extension efforts currently deployed by some countries in the region for the promotion of forage and pastoral crops remains insufficient. Due to financial constraints and lack of incentives to motivate extension agents, extension services are almost ineffective, which is illustrated by the limited adoption of improved varieties by farmers. Extension efforts in the field of seed production in general have to be improved to help farmers master production techniques. A weakness in the seed marketing system in general is the lack of extension efforts by seed companies and co-operatives to increase seed sales.

3.2 Problems and Inherent Constraints to Range Improvement Activities

Demographic pressures occurring in different countries in the region has caused an increase in demand for agricultural and livestock products. This has pushed farmers to overexploit pastoral resources and has led to overgrazing, causing productive rangelands to convert into marginal croplands. These effects have become further aggravated by:

- an absence of private investment in range equipment and the management sector;
- recurrent drought in the region;
- maladjustment of legislation to the range management activities;
- weakness and/or lack of forage reserves for feed shortages and drought periods;

- insufficiency of technical support to livestock holders in the pastoral regions; and
- insufficiency of research in range management fields.

These constraints have a direct or indirect effect on the development of pastoral seed demand. Although rangeland seeding practices have given positive results in some countries, their use has remained very limited. This low rate of realisation can be explained by:

- inadequate funding by the government for seeding activities;
- insufficiency of funds allocated to the rangeland rehabilitation programmes; and
- insufficiency of extension activities concerning rangeland improvement.

4. ACTIONS TO PROMOTE FORAGE SEED SUPPLY AND DEVELOPMENT

The scope of the formal forage seed supply is limited in the Near East and North Africa, where only around 10 to 15% of seed requirements are covered by the formal seed sector. Retention of seed from farmers harvests and farmer to farmer seed exchanges are still the most common sources of forage seed in all countries of the region. These practices have reduced considerably the use of certified seeds. Furthermore, they make it difficult to assess the seed needs in the region. In order to overcome some of the constraints stated above, the following actions should be taken.

4.1 At the Technical, Institutional and Policy Level

Elaboration of national strategies and plans for the development of forage and pasture seeds. Efforts should be made to promote use of forage and pasture crops within the local farming systems.

Promotion of private sector involvement in forage and pasture seed production. Establish legislation that creates a favourable environment for the development of the private sector. It should be noted that private companies are becoming increasingly involved in plant breeding and seed production in some countries, but their involvement is still restricted to a limited number of major crops. Private seed companies can contribute to strengthening national capacities for seed supply (Rihm, 1989) by:

(i) investing in variety research development;
(ii) assisting in establishing modern seed multiplication systems through the selection and training of farmers;
(iii) assisting in establishing quality control procedures;
(iv) assisting in securing optimum seed storage; and
(v) transferring new technologies.

Intensifying research in the seed production area, especially forage and pasture crop seed. The following actions should be undertaken to promote forage and pasture seed utilisation:

(i) promote the livestock industry (milk and meet);
(ii) enhance seed production techniques for forage crops
(iii) by the adaptation of appropriate seeding techniques in different ecological conditions, eliminate some constraints that hinder the extension of rangeland improvement in semi-arid and arid zones;
(iv) collect and evaluate plant genetic resources of the main forage and pastoral native species and promote their conservation in genebanks for ulterior utilisation;
(v) study the pastoral potentialities of local drought resistant species and their conservation in situ for future use in the development of marginal zones; and
(vi) develop an adapted technology to pastoral seed production.

Pastoral research in the long-term should be involved in seed selection and variety adaptation (from promising ecotypes and foreign variety introductions) to improve the utilisation of plant genetic resources.

Co-ordination of research, extension and seed production. Considering the limitation of human and financial resources, it is essential to co-ordinate efforts with seed production organisms and centres and different research institutions in order to:

(i) promote local production in the existing seed multiplication centres, of foundation seeds of forage and pasture species;
(ii) increase the rate of adoption by farmers of improved forage and pasture varieties;
(iii) achieve research results during a reasonable period of time.
(iv) assist farmers to master production techniques and other issues related to forage crop production; and
(v) contribute efficiently through the exchange of expertise and information to the development of range improvement techniques and seed production in the Near East and North Africa.

Developing on-farm participatory research. A large baseline study leading at farmers' perceptions of their needs for forage/pasture varieties and seeds is essential to better develop the seed sector. In order to gather farmer's perception data, it is necessary to train local extension agents and research scientists in participatory methods. Methodologies for gathering farmer perception data should include focus groups, case studies, group interviews, open interviews and structured surveys, and direct observation. Generally, this type of study also requires a preliminary analysis of socio-economic data. A handbook about participatory tools related to seed production techniques, species, commercialisation, and legislation should be developed.

Promoting integration of the formal and informal seed systems. This is a prerequisite to the preservation of landraces and traditional varieties and conservation of plant genetic resources, which must be promoted by the formal seed sector. The role of NGOs in implementing projects that support on-farm seed production should not be neglected, and efforts should be made to strengthen these activities.

Establishing seed legislation and regulations. One of the constraints to certified seed production of forage and pasture species in most countries in the region is the absence of technical rules for these species. It would be useful to set-up rules for at least species being multiplied in a given country. These rules have to be adapted to farmer's conditions relating to standards for multiplication, number of generations, and production techniques.

Encouragement of training. The success of steps leading to the development of local seed production can not be assured without the specialised training of technical personnel. Such training is currently limited in the region. Nevertheless, the intensification of short training programmes in seed production and seed technology could be undertaken at the local and regional level. Emphasis should be also given to on-job training of farmers and extension agents.

Reinforcing rangeland development actions. All rangeland development actions will have positive effects on pastoral seed utilisation. Among these actions, we can stress the following:

- reinforce and expand, where it is feasible, range improvement practices such as seeding and planting to revegetate selected rangelands;
- promote farmers awareness in low rainfall zones to redirect their production systems to integrate forage crops with livestock breeding;
- encourage livestock holders to plant fodder shrubs on converted cultivated lands that had originally been rangeland, particularly in North Africa.

4.2 At the Regional Level

Strengthening of the existing networks dealing with forage and pasture seed production in the region. The exchange of plant materials, expertise and information linked to research on forage and pasture species should be promoted. Activities of these networks should be assisted by international organisations and by the "Centres of Excellence" in the WANA countries to develop and manage forage and pasture seed production databases in the region.

Reinforcement of activities of the international centres and institutions (FAO, IPGRI, ICARDA, CIHEAM, etc.) in the region. The following are some of the areas where assistance is to be considered:

- training in forage and pasture seed production;
- reinforcing collaborative research within the region;
- providing consultants for example to improve and standardise seed legislation;
- developing projects addressing weaknesses in the forage and pasture seed supply system;
- supporting/reinforcing networks dealing with forage and pasture seed production in the region.

5. CONCLUSION

Forage and pasture seed production in the region is less developed compared to other crops. This is probably due to the fact that forage seeds are considered by all stakeholders and mainly by farmers as a by-product to forage production. As a result, most seeds are produced and distributed through the informal sector. Governments should recognise the importance of this sector in the preparation of their seed strategies and plans. Privatisation of the forage seed sector should be carefully analysed and policy makers should take into consideration the fact that private companies will not easily invest in a sector where the demands are low and uncertain. International institutions should fulfil their role by assisting countries from the region in the development of the seed sector through technical and financial assistance and by stimulating the reinforcement of regional collaboration.

6. REFERENCES

Abd El-Wanis, M.S. 1995. The Seed Industry in Egypt. ICARDA, Focus on Seed Programs N°5. Giza, Egypt.

Abi Antoun, M. 1997. The Lebanon Seed Industry. ICARDA, Focus on Seed Programs N°9. Rayak, Lebanon.

Abu-Arigal, A.M. 1997. Yemen Seed Program: Country Report on Activities related to Pasture Seed. Paper presented at the Workshop on Forage Seed Production. 27-31 October, 1997. Addis Ababa, Ethiopia. ICARDA/ILRI; Proceedings in Press.

Al-Braheem, S.M. 1989. Seed Production in the Kingdom of Saudi Arabia. In van Gastel A.J.G., S. Varma and S. Abdul Elah Hamood (eds.). Seed Production in the Arabian Peninsula. ICARDA. Aleppo, Syria.

Al-Tashi, K.M.H. 1996. The Yemen Seed Industry. ICARDA, Focus on Seed Programs N°6. Dhamar, Yemen.

Anonymous. 1995. Acquaintance with the Seed and Plant Improvement Institute (SPII). Agricultural Research, Education and Extension Organization. Ministry of Agriculture. Brochure. Kharaj, Iran.

Balikcioglu, T.T. 1996. The Turkish Seed Industry. ICARDA, Focus on Seed Programs N° 7. Ankara, Turkey.

Bouziri, A. 1997. The Tunisian Seed Industry. ICARDA, Focus on Seed Programs N°10. Tunis, Tunisia.

Chouki, S. 1997. Forage and Pasture and Seed Production in Tunisia. Paper presented at the Workshop on Forage Seed Production. 27-31 October, 1997. Addis Ababa, Ethiopia. ICARDA/ILRI; Proceedings in Press.

FAO, 1996. The State of the World of Plant Genetic Resources for Food and Agriculture. FAO, Rome, Italy.

Madaratti, A., and I. Sayed 1995. The Syrian Seed Industry. ICARDA, Focus on Seed Programs N° 4. Aleppo, Syria.

Rihm, E. 1989. Role of Private Seed Companies in Building Up the Seed Supply in the Arabian Peninsula. In van Gastel A.J.G., S. Varma and S. Abdul Elah Hamood (eds.). Seed Production in the Arabian Peninsula. ICARDA. Aleppo, Syria.

Sidahmed, A.E. 1991. Towards Strengthening the Range/Livestock Research and Extension Capabilities of the National Institutions in the Near East and North Africa. Proceedings IV International Rangeland Congress.

Tahiri, A., M. Bouchrifa, M. Tazi, and A. Lahlou. 1997. Production et Approvisionnement en Semences Fourragères. In G. Yaritz et M. Bounejmate (éd.). Production et Utilisation des Cultures Fourragères au Maroc. pp; 294-303. INRA, Rabat, Maroc.

Tazi, M. 1995. Le Secteur des Semences Pastorales au Maroc. Situation Actuelle et Perspectives. Mémoire d'accès au grade d'Ingénieur en Chef. 84 p. Ministère de l'Agriculture et de la Mise en Valeur Agricole. Rabat, Maroc.

Tazi, M. 1997. The Pasture and Seed Production in Morocco. Paper presented at the Workshop on Forage Seed Production. 27-31 October, 1997. Addis Ababa, Ethiopia. ICARDA/ILRI; Proceedings in Press.

Tourkmani, M. 1994. Production et Contrôle des Semences au Maroc. ICARDA, Focus on Seed Programs N°1. Rabat Morocco.

World Resources Institute. 1994. World Resources 1994-95. A Guide to the Global Environment. People and The Environment. Oxford University Press. Washington DC, USA.

Xenophontos, E. 1997. The Cyprus Seed Industry. ICARDA, Focus on Seed Programs N°8. Nicosia, Cyprus.

Yousef, O.A.F. and M.H. Ali. 1994. The Sudan Seed Industry. ICARDA, Focus on Seed Programs N°2. Khartoum, Sudan.

Zaroug, M.G. 1988. Development of a Regional Program on Biological Nitrogen Fixation to Enhance Agricultural Production in the Near East. In D.P. Beck and L.A. Materon (ed.). Nitrogen fixation by legumes in Mediterranean agriculture. pp. 25-32.Martinus Nijhoff Publishers. The Netherlands.

Zentani, A. 1995. The Libyan Seed Industry. ICARDA, Focus on Seed Programs N°3. Tripoli, Libya.

Annex 1. Natural Resources for agriculture in the Near East and North Africa.

Country	**Total Land Area (1000 ha)**	**Arable Land as % of Total Land**	**Permanent Pastures as % of Total Land**	**Forest as % of Total Land**	**Other Land as % of Total Land**	**Irrigated Land as % of Arable Land**
Algeria	238 174	3,21	13,03	1,71	82,05	5,07
Cyprus	924	16,88	0,54	13,31	69,26	23,08
Egypt	99 545	2,63	0,00	0,03	97,34	100,00
Jordan	8 893	4,48	8,89	0,79	85,84	16,00
Lebanon	1 023	29,42	0,98	7,82	61,78	28,10
Libya	175 954	1,22	7,56	0,39	90,82	12,31
Djibouti	2 318	0,00	8,63	0,26	91,11	-
Mauritania	102 522	0,20	38,28	4,32	57,20	5,85
Morocco	71 230	13,51	37,76	12,64	36,30	13,25
Palestine	618	37,54	24,27	4,85	33,33	9,48
Syria	18 392	30,58	42,14	3,94	23,31	12,44
Tunisia	15 536	31,33	23,72	4,19	40,76	4,76
Sudan	237 600	5,43	46,30	18,87	29,40	15,00
Somalia	62 734	1,66	68,54	14,44	15,36	11,00
Kyrgyz Republic	19 130	7,32	45,22			10,00
Azerbaijan	8 610	18,58	25,55			37,00
Tajikistan	14 270	5,61	23,23			17,00
Turkmenistan	48 810	2,46	68,55			3,00
Afghanistan	65 209	12,35	46,01	2,91	38,73	34,27
Bahrain	68	2,94	5,88	0,00	91,18	50,00
Iran	163 600	9.20	26,89	11,01	52,89	38,21
Iraq	43 737	12,46	9,15	4,31	74,08	46,79
Kuwait	1 782	0,28	7,63	0,11	91,98	40,00
Oman	21 246	0,28	4,71	0,00	95,01	95,08
Pakistan	77 080	27,38	6,49	4,45	61,69	80,42
Qatar	11	0,55	4,55	0,00	94,91	0,00
Saudi Arabia	214 969	1,10	39,54	0,56	58,80	39,58
Turkey	76 963	36,06	11,09	26,25	26,60	8,67
United Arab Emirates	8 360	0,47	2,39	0,04	97,11	12,82
Yemen	52 797	3,04	30,43	7,69	58,85	19,38
Total	1 852 105	7,25	27,95	6,72	56,08	30,05

Source: World Resources Institute 1994

Annex 2. Seed legislation and Stage of development of seed sector in the Near East and North Africa.

Country	Variety release	Seed Law	Seed quality control	Seed Distribution	Formal Forage seed production
Algeria	Yes	Yes	Yes	Yes	Yes
Cyprus	Yes	Yes	Yes	Yes	Yes
Egypt	Yes	Yes	Yes	Yes	Yes
Jordan	Yes	Yes	Yes	Yes	Yes
Lebanon	Yes	Yes	Yes	Yes	No
Libya	Yes	No	No	Yes	No
Djibouti	NA	NA	NA	NA	NA
Mauritania	Yes	No	Yes	Yes	No
Morocco	Yes	Yes	Yes	Yes	Yes
Palestine	NA	NA	NA	NA	NA
Syria	Yes	No	Yes	Yes	Yes
Tunisia	Yes	Yes	Yes	Yes	No
Sudan	Yes	Yes	Yes	Yes	Yes
Somalia	NA	NA	NA	NA	NA
Afghanistan	Yes	No	Yes	Yes	Yes
Kyrgyz Rep.	NA	NA	NA	NA	NA
Azerbaijan	NA	NA	NA	NA	NA
Tajikistan	NA	NA	NA	NA	NA
Turkmenistan	NA	NA	NA	NA	NA
Bahrain	NA	NA	NA	NA	NA
Iran	Yes	No	Yes	Yes	Yes
Iraq	Yes	Yes	Yes	NA	NA
Kuwait	No	No	Yes	Yes	No
Oman	Yes	No	NA	NA	No
Pakistan	Yes	Yes	Yes	Yes	NA
Qatar	Yes	No	No	No	No
Saudi Arabia	Yes	Yes	Yes	Yes	Yes
Turkey	Yes	Yes	Yes	Yes	Yes
United Arab Emirates	No	No	NA	NA	No
Yemen	Yes	No	Yes	Yes	No

"THE OECD SCHEMES"

OECD SCHEMES FOR THE VARIETAL CERTIFICATION OF SEED MOVING IN INTERNATIONAL TRADE

Bertrand Dagallier
Administrator,
Agricultural Codes and Schemes at the OECD, Paris

What is OECD?

The Organisation for Economic Co-operation and Development (OECD) is an intergovernmental forum composed of 29 market economy member countries from four continents (Europe, America, Asia and Oceania). OECD specialises in all sectors of economic activity, and its mandate is to allow governments to study and formulate the best policies. It provides various views on current topics, from unbinding policy advice to formal recommendations and binding decisions. Some of its activities are open to non-member countries, which is the case of seed trade regulations and more precisely the OECD Seed Schemes.

What are the OECD Seed Schemes?

The OECD Seed Schemes are recognised world-wide for the *varietal certification of seed moving in international trade.* Their establishment (initiated in 1958) resulted from the combination of a fast-growing seed trade, the regulatory tradition of European countries, the development of off-season production, the seed breeding potential of large exporting countries and the support of private industry.

By the end of 1999, **48 countries** will be participating in the OECD Seed Schemes (29 from Europe, 7 from North and South America, 6 from Africa, 4 from Asia and 2 from Oceania). Participating countries from the Near East, North Africa and around the Mediterranean Sea are: Egypt (which joined last year), Israel, Iran, Cyprus, Turkey, Greece, Croatia, Slovenia, Italy, France, Spain, Morocco and Tunisia.

There are six Seed Schemes - adherence is voluntary for all schemes. Membership varies according to each scheme:

- ***Herbage and Oil Seed*** (46 countries)
- ***Cereals*** (44 countries)
- ***Maize and Sorghum*** (35 countries)
- ***Beet*** (29 countries)
- ***Vegetables*** (22 countries)
- ***Subterranean Clover and Similar Species*** (4 countries)

Scope and requirements of the OECD Seed Schemes

OECD Seed Schemes are designed to encourage the use of seed of consistently high quality in participating countries. The Schemes authorise the use of labels and certificates for seed produced and processed for international trade according to agreed principles. The OECD certification is applied to cultivars satisfying DUS tests (Distinction, Uniformity and Stability) and the Schemes aim to ensure varietal identity and purity through seed multiplication, processing and labelling.

A consequential benefit of the Schemes is the removal of technical trade barriers for the OECD certified seed, which is recognised as "quality-guaranteed" seed. In 1997/98, more than 350 000 tonnes of seed were OECD-certified, traded and used by farmers.

The Annual List of Cultivars eligible for OECD certification includes cultivars which are officially recognised as distinct and having an acceptable value in at least one country. It contains most internationally traded cultivars, which have grown steadily in the past twenty years to reach about 20 000 cultivars in last year's issue. This list is now available on the Internet (free access) at *http:/www.oecd.org/agr/code/index.htm.*

Trueness to type: Through the OECD Seed Schemes, participating countries agree on common requirements and methods of maintaining the variety characteristics throughout the seed multiplication process, especially when seed is multiplied abroad.

Minimum standards: Participating countries recognise that seed lots must satisfy minimum levels for varietal identity and purity to be preserved. These requirements are achieved by using previous cropping conditions such as isolation distances and through field inspections and plot control as appropriate. Chemotaxonomic tests are also used.

Seed categories: The following categories of seed are recognised in the Schemes and each corresponds to a well-specified generation number and associated technical conditions. They include pre-basic seed, basic seed, and certified seed. This nomenclature follows those used traditionally in Europe, North America and elsewhere.

Samples: OECD Certification uses ISTA (or, if necessary, similar) sampling and testing methods. It has also incorporated ISTA's lot size limits in its rules.

How does the system operate?

The government of each country participating in the OECD Schemes designates a National Authority to implement the Schemes. The operation and progress of the Scheme is reviewed at an annual meeting of representatives of designated authorities held alternatively in Paris and in a country participating in the Schemes (e.g. South Africa in 1998, Germany in 2000, Bolivia in 2002). Proposals for new rules or adaptation of the existing rules to current needs are made regularly, and in addition, these meetings foster the sharing of information and experiences.

International organisations and governments representing industry and farmers participate as observers in the OECD meetings. FAO is actively represented by its Seed Service (AGPS). UPOV, ISTA and FIS/ASSINSEL collaborate with the OECD. The European Commission has a recognised status in OECD since the current 15 EU Member States are members of the Organisation.

Among the technical issues recently discussed, the following should be mentioned: separation of the "Herbage and Oilseed Scheme" into two different Schemes; previous cropping requirements for some species; identity and purity standards for oil seed hybrids derived from new breeding methods; agreements for seed multiplication abroad; weeds and rejection of seed crops; varietal mixtures of herbage seed; percentage of mandatory post control of the OECD certified seed; non-final certification of unprocessed seed moving in international trade; the relevance of genetic modifications for certification; the relevance of certification of ecotypes or landraces; identity preservation of the harvested grain; and whole bag labelling.

When a country joins the OECD Seed Schemes, there is no obligation to subject all domestic seed production adhere to the OECD requirements. The Schemes are often only applied to seed, which will be exported. The first objective of the OECD Seed Schemes is to facilitate the international trade of seed by providing an official and recognised method for certification. The Seed Schemes, which may be part of advisory and extension services, or export promoting policies, have proven to be useful in enhancing the use of clear and reliable methods in the production of seed and also benefiting the internal markets. They enhance national competitiveness and may be seen as a public service provided to firms, particularly smaller.

How do states and companies interact?

The success of the Schemes depends upon close and continuous co-operation between the institutions, which maintain the variety, seed producers, traders and the designated authorities in participating, countries. Particularly when seed multiplication takes place outside the country of registration of a cultivar and the Designated Authority has permitted such a commercial multiplication, the institutions maintaining the variety should be consulted and close contact established between the designated authorities in the countries concerned.

Private companies can do as well as governments in establishing and maintaining the distinctness, uniformity and stability of their cultivars, not only domestically but also across borders. However, companies follow their own objectives, perform within constraints of each market and compete through differing levels of standards and information. Therefore, *there remains a need for minimum criteria to be commonly defined, endorsed and enforced. The OECD Schemes provide a legal system to control minimum standards at the international level.* Its contribution to monitoring the identity and purity of seed brings additional benefits to seed producers.

Recent work has focused on a voluntary experiment pertaining to the so-called "accreditation" of field inspection. This allowed limited and conditional recognition of field inspection by company staff of some certified-seed crops. This experimental departure from the rules was agreed in the wake of the 1989 EC experiment. Thirteen countries (out of 48) have participated in the OECD experiment with no adverse results. Accreditation tends to be associated with the spreading of quality assurance systems. The 1999 Annual Meeting of the Designated Authorities agreed on the extension of the experiment to other aspects of seed certification such as sampling, laboratory testing, and labelling. The procedure will be defined in conjunction with ISTA and FIS.

The future environment of the Seed Schemes

The OECD Seed Schemes must respond to the increasing demand for membership from new countries. Starting with 17 countries in 1958, the number of participants has reached 48 (including the recent admission of Brazil and Lithuania proposed during the 1999 Annual Meeting, which should become effective by the end of the year). Other official applications are currently in progress and a fairly large number of countries --including countries in the Near East and North Africa have shown interest and may wish to join in the near future.

As more countries enter international markets, the growth of the OECD Seed Schemes is inevitable. In addition, seed "consumers" are becoming more sophisticated, they demand greater certainty and safety in what they buy. At the same time, careful management of public resources and funds must be a constant feature of the OECD Schemes to ensure that regulation/quality control costs remain low.

The present co-operation among countries and international organisations working in seed is viewed as a response to the developing concern for a market-responsive regulatory approach to seed trade. The up coming 1999 World Seed Conference, to be co-sponsored by ISTA, FIS/ASSINSEL, OECD and UPOV, could be a landmark step towards a new regulatory balance to seed movement and trade among countries.

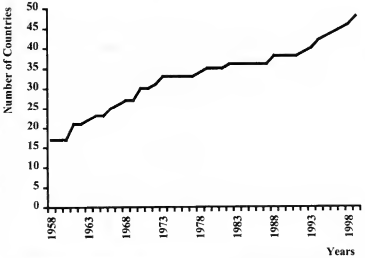
Each country confronted with different legal settings, institutional balances and market relations, must devise its own approach. At the same time, the multiplicity of approaches must remain consistent among countries entering the world trade market as importers or exporters. Therefore, participation in an international organisation yields benefits. The operating cost of such an international organisation is reduced when more countries participate.

The OECD is open to developing already promising contacts with the Near East and North Africa region and welcomes new participating countries to contribute to international seed trade development.

Number of cultivars eligible for certification (all data approximate)

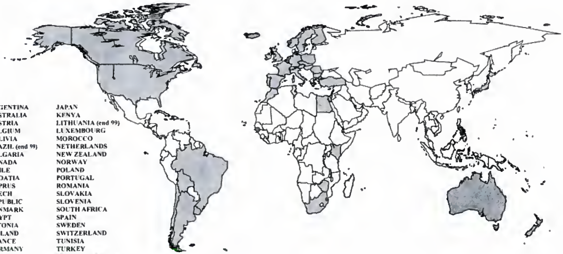
Cultivars	1974	1984	1994	1997
Legumes	400 (33 spp)	900 (42 spp)	2 500 (54 spp)	3 025 (54 spp)
Gramineae	700 (61 spp)	1 399 (72 spp)	2 000 (81 spp)	2 400 (81 spp)
Cruciferae	250	360	560	690
Other Herbage and Oil Seed	--	210 (7 spp)	1 340 (9 spp)	1 895 (10 spp)
Cereals	900	1 550	2 575	3 355
Sugar beet	210	360	680	1 085
Fodder beet	150	140	130	
Subterranean clover		20	50	52
Maize		1 275	3 400	4 976
Sorghum			440	580
TOTAL	**2 645**	**6 175**	**13 675**	**18 050**

Number of Countries participating in the OECD Seed Schemes (1958-1999)



Contact:OECD 2, rue André Pascal 75775 Paris Cedex 16 - France
Mr DEBOIS Jean-Marie - Principal Administrator, Agricultural Codes and Schemes
Tel: +33.1.45.24 95.48 Fax: +33.1.45.24 95.16 Email: jean-marie.debois@oecd.org Mr. DAGALLIER Bertrand - Administrator, Agricultural Codes and Schemes
Tel: +33.1.45.24 18.78 or 95.48 Fax: +33.1.45.24.78.34 Email: bertrand.dagallier@oecd.org

COUNTRIES PARTICIPATING IN THE OECD SEED SCHEMES - 1999



ARGENTINA
AUSTRALIA
AUSTRIA
BELGIUM
BOLIVIA
BRAZIL (end 99)
BULGARIA
CANADA
CHILE
CROATIA
CYPRUS
CZECH REPUBLIC
DENMARK
EGYPT
ESTONIA
FINLAND
FRANCE
GERMANY
GREECE
HUNGARY
ICELAND
IRAN
IRELAND
ISRAEL
ITALY
JAPAN
KENYA
LITHUANIA (end 99)
LUXEMBOURG
MOROCCO
NETHERLANDS
NEW ZEALAND
NORWAY
POLAND
PORTUGAL
ROMANIA
SLOVAKIA
SLOVENIA
SOUTH AFRICA
SPAIN
SWEDEN
SWITZERLAND
TUNISIA
TURKEY
UNITED KINGDOM
UNITED STATES
URUGUAY
ZIMBABWE

Appendix 1

LIST OF PARTICIPANTS

CYPRUS
CHIMONIDOU Dora
Agricultural Research Officer
P.O. Box 22016
Nicosia – Cyprus
Tel.: 00 357-2-305101
Fax: 00 357-2-366770
e-mail: flowers@arinet.ari.gov.cy

EVANGELIDIS Andreas
Agriculturist
Sales Manager
Shokiouroglou co. Ltd.
Xylophagou

GAVRIEL Ioannis
Virologist, Agricultural Officer
Department of Agriculture
Nicosia – Cyprus
Tel.: 00 357-2-301827
Fax: 00 357-2-741425

GREGORIOU Costas
Head of Horticultural Section, Senior Agr. Res. Officer
Agricultural Research Institute
P.O. Box 22016
Nicosia – Cyprus
Tel.: 00 357-2-305101
Fax: 00 357-2-316770
e-mail: gregor.@arinet.ari.gov.cy

KARI Andreas
Plant Breeder / Phytopathologist
A.R.O.
Agricultural Research Institute
Nicosia – Cyprus

LAMBROU Stella
Agronomist
Technical Manager
C/o Spyros Stavrinides Chem. Ltd.
Stassinos Ave. 28
Nicosia – Cyprus
Tel.: 00 357-2-756984
Fax: 00357-2-756902

PANTELI Costakis
Economist
Hras 6, Pervolia
Larnaca – Cyprus
Tel.: 00 357-9-439866
Fax: 00 357-4-656211

PAPAGEORGIOU Nicolaos
Agriculturist
Extension Service
District Agric. Office of Famagusta
P.O. Box 481
Larnaca – Cyprus
Tel.: 00 357-4-630354
Fax: 00 357-4-630514

XYSTOURIS Petros
Agriculturist
Agricultural Officer – Seed Production Centre
Department of Agriculture
1412 Nicosia
Cyprus
Tel.: 00 357-2-305343
Fax: 00-357-2-343419
e-mail: Joagrg@cytanet.com.cy

ZANNETOS Christos
Agronomist
Stasinou Ave. No. 28
Nicosia
Tel.: 00 357-2-756984
Fax: 00 357-2-756902

ZANNETOS Stavros
28 Stasinou Ave.
P.O. Box 21278
Nicosia – Cyprus
Tel.: 00 357-2-756984
Fax: 00 357-2-756902

DJIBOUTI
HERSI Rachid Elmi
Chief of Plan Production
P.O. Box 224 Djibouti
Tel.: 00 253-341496
Fax: 00 253-355837

EGYPT
ABOU-HADID Ayman
Professor of Horticulture
P.O. Box 68
Hadajek Shobra
Cairo – Egypt
Tel.: 00 202-4441386
Fax: 00 202-3490053
e-mail:ruafah@rusys.eg.net

IDRIS Mohamed
African Farmers Union & C.A.C.U.
Chairman
P.O. Box 14
Gizah – Egypt 12211
Tel.: 00 202-3612865
Fax: 00 202-3609256
e-mail:egypt.cacu@iec.egnet.net

MAHMOUD Osama Abdel Hakam
General Director for Seed Certification
8, Gamma Street - Cairo
Giza – Egypt
Tel.: 00 202-5720839
Fax: 00 202 5720981

IRAN
DEHGHAN-SHOAR Majid
Associates Prof. Of Seed Technology
Head of Seed Tech. Dept. and DG of
International and Regional Org. of the Ministry
17th floor Ministry of Ag. Technology
Iran
Tel.: 0098-21-650284
Fax: 0098-21-654590
e-mail:MDehghan@asid.moa.or.ir

TAEB Mohammad
Agricultural Research, Extension and Education
Organisation
Ministry of Agriculture
Research Deputy
AREEO, P.O. Box 111
Tabnak Ave. Tehran 19835 – Iran
Tel.: 0098-21-2400857
Fax: 0098-21-2400568
e-mail: Taeb@Dpi.net.ir

IRAQ
TURKI Kadam Falih
Ministry of Agriculture
Director of Agriculture in Basrah
Basrah – Iraq
Tel.: 00 964 211974

JORDAN
NOUR Abdel Adnan
Ministry of Agriculture
Head of Plant Production Control Division
Amman – Jordan
Tel.: 00 962 5686151
Fax: 00 962 5686310

LEBANON
BEJJANI Chéhandé
Head of Import-Export Department
Ministry of Agriculture
Lebanon
Tel.: 00 961-5-530630

LYBIA
ZAIDI Mohamed
Director
National Centre for Seed Multiplication and
Production
Tripoli – Libya
Tel.: 00 218 21 3601041/48
Fax: 00 218 21 3614993

MOROCCO
AKAABOUNE Ahmed
Director of Commerce
30 Rue Moulay Ali
Chrif BP 67 Rabat
Tel.: 00 212 7762289
Fax: 00 212 7760386

BOUCHOUTROUCH Mustapha
Head of Seed Service
Institut National de la Recherche Agronomique
B.P. 415 Avenue de la Victoire – Rabat
Tel.: 00 212 732392

TAZI Mohammed
Director
Centre de Production des Semences Pastorales
BP 79 El Jadida, Morocco
Tel./Fax: 00 212 3 344350
e-mail: M.tazi@kenzanet.net.ma

OMAN
AL-HARTHY A.Aziz
Assistant to the D.G. of Agr. Research Center
Ministry of Agriculture & Fisheries
P.O. Box 50, PC 112 SEEB
Sultanate of Oman
Tel.: 00 968 893019
Fax: 00 968 893097
e-mail: Omar95@yahoo.com /
Omar95@gto.net.om

PAKISTAN
CHAUDHRY Muhammad Naseer
Director
Federal Seed Certicication & Registration Dept
G-9/4 Islamabad, Pakistan
Tel.: 00 92 51 9260236
Fax: 00 92 51 9260234
e-mail: ESCD@seed .sdpnk.undp.eng

MUHAMMED Amir
President, Asianics Agro-Dev Int.
H3, St.35, F-8/1 Islamabad, Pakistan
Tel.: 00 92 51-9222277
Fax: 00 92 51-276492
e-mail: ASIANICS@ISB.COMSATS.NET.PK

SUDAN
ABDALLA Abdalla
Chairman of the Board of Arab Sudanese Seed Company
C/o FAO Office, P.O. Box 1117
Khartoum – Sudan
Tel.: 00 249 11 780110

KHAMIS Mohamed
Seed Administration
Ministry of Agriculture and Forestry
P.O. Box 285
Khartoum – Sudan
Tel.: 00 249 11 777035

UNITED ARAB EMIRATES
ABBOUDI Abdalla
Manager of Research Dept.
Ministry of Agriculture and Fisheries
P.O. Box 1509
Dubai
Tel.: 00971-4-2958161
Fax: 00971-4-295776
e-mail:AHUSSAIN45@HOTMAIL.COM

YEMEN
ABU-Arigal Ahmed
Chairman & D.G.
General M. Seed Corp.
Yemen –Dhamar
P.O. Box 87282
Tel.: 00967-6-509433/4
Fax: 00967-6-509449

FIS/ASSINSEL
HEFFER Patrick
Assistant Secretary General
FIS ASSINSEL
Chemin du Reposoir 7
1260 Nyon
Switzerland
Tel.: +41-223654420
Fax: +41-22365 4421
e-mail: fis@worldseed.org
WEB:http://www.worldseed.ord

GNIS (France)
BURGAUD François
International Manager
GNIS
44 rue du Louvre
75001 Paris – France
Tel.: 00 33 14233 7694
Fax: 00 33 14233 2776
e-mail: francois.burgaud@gins.Fr

GTZ (Ghana)
Van GASTEL Tony
IITA / GTZ, Team Leader
P.O. Box 9698 KIA
Accra, Ghana
Tel.: +233-21-765567
Fax: +233-21-765567
e-mail: wasdu@ghana.com

ICARDA
KUGBEI Samuel
Seed Economist, ICARDA
P.O. Box 5466, Aleppo – Syria
Tel.: 00963-21-213477
Fax: 00963-21-213490
e-mail: S.Kugbei@cgiar.org

TURNER Michael R.
Head of Seed Unit
ICARDA, P.O. Box 5466
Aleppo – Syria
Tel.: 963-21-221 3477
Fax: 963-21-221-3490
e-mail: M.Turner@cgiar.org

ISTA
MUSCHICK Michael
Executive Officer
ISTA
Reckenholzstrasse 191
P.O. Box 412
CH-8046 Zurich, Switzerland
Tel.: 00 41-13776000
Fax: 00 41-13776001
e-mail: estach@iprolink.ch

T.C.A.S. (Palestine)
MONTASEB Majdi
General Director
The Center for Agricultar Services T.C.A.S.
Hebron, P.O. Box 506
Palestine – West Bank via Israel
Tel.: 00972-22227922
Fax: 00972-22227922
e-mail: tcas@p-ol.com

FAO
BUSHAMUKA Victor
International Consultant/Seed and Plant Genetic Resources, FAO
404 Esty Street
Ithaca, NY 14850, USA
e-mail: Bush3@clarityconnect.com

DUWAYRI Mahmud
Director, Plant Production and Protection Division
Agriculture Department
FAO, Via delle Terme di Caracalla
00100 Rome – Italy
Tel.: 00 39 06 5705 3969
Fax: 00 39 06 5705 6347
e-mail: Mahmud.Duwayri@fao.org

MENINI Umberto
Chief Seed and Plant Genetic Resources Service, (AGPS)
Plant Production and Protection Division
FAO, Via delle Terme di Caracalla
00100 Rome – Italy
Tel.: 00 39 06 5705 3969
Fax: 00 39 06 5705 6347
e-mail: Umberto.Menini@fao.org

SIKORA Ivan
Senior Officer, AGPS
FAO, Via delle Terme di Caracalla
00100 Rome – Italy
Tel.: 00 39 06 5705 3969
Fax: 00 39 06 5705 6347
e-mail: Ivan.Sikora@fao.org

VAKIS Nicos
FAO Consultant
6 George Christodoulou
2014 Nicosia – Cyprus
Tel.: 00 357-2-424027
Fax: 00 357-2-424022

ZEHNI Mohamed S.
FAO Consultant
149, Triq il Qasam
Swiequi STJ Malta
Tel.: 00 356-375479
Fax: 00 356-375479
e-mail: mzehni@arbit.net.mt

Appendix 2

تقرير عن الملتقى الفنى لبرامج وسياسات البذور فى الشرق الأدنى وشمال أفريقيا
لارناكا –قبرص
من ٦/٢٧ إلى ١٩٩٩/٧/٢

١ – مقدمة

قامت منظمة الأغذية والزراعة للأمم المتحدة بتنظيم الملتقى بتعاون وثيق مع معهد الأبحاث الزراعية بنيقوسيا (قبرص)، وقد عقد فى لارناكا فى خلال الفترة من ٦/٢٧ إلى ١٩٩٩/٧/٢. وبناء على توصيات مؤتمر القمة العالمى للأغذية عقد الملتقى فى إطار اختصاصات المنظمة لتيسير تنفيذ خطة العمل العالمية لصيانة الموارد النباتية الوراثية للأغذية والزراعة واستخدامها التى ووفق عليها فى ليبزيج، أمانيا فى يونيو/حزيران ١٩٩٦.

وكان المشاركون الذين عينتهم الحكومات من دول الشرق الأدنى وشمال أفريقيا من البلدان الآتية: قبرص، جيبوتى، مصر، جمهورية إيران الاسلامية، العراق، الأردن، لبنان، ليبيا، المغرب، عمان، باكستان، السودان، الإمارات العربية المتحدة، واليمن، بالإضافة الى ممثلين عن المنظمات الدولية ومراكز البحوث الزراعية الدولية والمنظمات الحكومية وغير الحكومية بالإضافة الى ممثلين عن المنظمات العاملة والخاصة العاملة فى صناعة البذور، كما حضر الملتقى مشاركين آخرين بصفتهم الشخصية بصفة مراقب.

وقد ألقى كلمة الافتتاح السيد/ ب. اريستوتيلوس نائب المدير العام فى وزارة الزراعة والموارد الطبيعية والبيئة نائبا عن معالى السيد/ كوستاس ثيمستو كليوس وزير الزراعة والموارد الطبيعية والبيئة فى قبرص. وقد جاءت هذه الكلمة الافتتاحية بعد كلمة الدكتور محمود دويرى مدير قسم الانتاج النباتى ووقاية النباتات نائبا عن منظمة الأغذية والزراعة للأمم المتحدة.

وكان الهدف من الملتقى:

- وضع السياسات الملائمة الخاصة بإنتاج البذور وتوزيعها وذلك على المستويات الحكومية والتجارية ومستوى المؤسسات التجارية الصغيرة للمساعدة على تعزيز المبادرات التى تدعمها الحكومات لتلبية متطلبات صغار المزارعين من الأصناف المختلفة، مع الاهتمام الخاص باحتياجات المزارعات؛
- توفير البيئة المناسبة أو التشجيع على إقامتها، حسب مقتضى الحال، لوضع المشروعات الصغيرة لانتاج وتوزيع البذور حيثما لا تتوافر هذه البيئة؛
- تقوية الروابط بين بنوك الجينات ومنظمات تربية النباتات ومنتجى البذور والمشروعات الصغيرة لإنتاج وتوزيع البذور؛

- دراسة خطط التحكم فى نوعية البذور وبخاصة تلك المتعلقة بالمشروعات الصغيرة،

- دراسة التدابير التشريعية التى تسمح بتوزيع وتجارة الأصناف الأصلية والأصناف التى يستنبطها المزارعون والأصناف القديمة فى حالة توافقها مع مواصفات التداول والاتجار المتعلقة بالآفات والأمراض، والصحة والبيئة مثلما الحال فى الأصناف التقليدية أو المسجلة؛

٢ - الملتقى

أعدت المنظمة وثيقة مرجعية لتحديد إطار للمناقشات خلال الملتقى. وقد استكملت هذه الوثيقة بالعديد من الأوراق المواضيعية بشأن وضع السياسات والبرامج التى تقود الى توفير إمدادات مستدامة من بذور المحاصيل؛ والموارد الوراثية النباتية للأغذية والزراعة فى إقليم الشرق الأدنى وشمال أفريقيا. وتتضمن الأقسام التالية ملخصا موجزا لكل ورقة من الأوراق المقدمة مع إبراز الجوانب الرئيسية فى المناقشات التى دارت بعد تقديم كل منها:

٢-١ تقويم انتاج وتحسين البذور فى دول الشرق الأدنى وشمال أفريقيا:

أعدت هذه الوثيقة بقسم البذور والموارد الوراثية النباتية فى قسم الانتاج النباتى ووقاية النباتات بمنظمة الأغذية والزراعة، استنادا الى إسهامات الحكومات والأعضاء والمعلومات المستقاة من الحلقات الدراسية العلمية واللقاءات ذات الصلة بالموضوع. وتستعرض الوثيقة الظروف الايكولوجية الزراعية والاقتصادية الاجتماعية فى الإقليم فضلا عن التنمية الزراعية العامة التى تؤكد أن الاقليم يعتمد اعتمادا كبيرا على استيراد الغذاء مما يجعله من أكثر المناطق استيرادا للغذاء فى العالم النامى. ويعتبر نقص إمدادات البذور المحسنة للمحاصيل الرئيسية من بين العوامل العديدة التى تؤدى الى هذا الوضع.

وتختلف حالة المصادر الرسمية للبذور من دولة لأخرى بالإقليم. إذا أن بضع دول فقط هى التى يمكننا القول أن لديها قطاع بذور رسمى متطور مبنى على أساس جيد، وقوانين للبذور ونظام للتسجيل وخطوات محددة لاختبارات الأصناف. وفى حين تعد العقبات المادية والفنية من العوائق الخطيرة لما لها من إسهام فى إضعاف قطاع البذور فى هذه الدول، فإن العديد من نقاط الضعف فى قطاع البذور ترجع إلى عوامل تتعلق بالسياسات والإدارة وأخرى تتعلق بالظروف الاقتصادية والاجتماعية. وتوضح الورقة الأهمية القصوى لتوفير الظروف التى تساعد على التوصل الى تحقيق التنمية المتوازنة فى كل من قطاعى الامدادات بالبذور الرسمى وغير الرسمى. ولإحداث ذلك. فإن على الحكومات أن تدرك أهمية قطاع البذور غير الرسمى وتعمل على توفير السياسات والاجراءات اللازمة لتنمية هذا القطاع. ثم قدمت الوثيقة اقتراحات عريضة يمكن أن توفر الأساس لوضع خطط عمل قطرية وفقا للظروف والاحتياجات الداخلية الخاصة بكل بلد.

واختتمت الوثيقة بالتأكيد على الحاجة لتعاون وتجانس أفضل على المستويات القطرية والاقليمية والدولية لتقوية صناعة البذور فى الاقليم، واقترحت انشاء هيئة استشارية لمساعدة بلدان المنطقة لتعبئة الموارد فى هذا السبيل.

Copyrighted material

ومن خلال المناقشات بين الحاضرين ظهرت النقاط التالية:

- ضرورة الاهتمام بأبحاث البذور ومواد الغرس الخاصة بنباتات الزينة وأشجار الفاكهة.
- ضرورة التدريب على تكنولوجيا البذور بما فى ذلك تدريب المزارعين فى الاقليم.
- ثمة حاجة لإنشاء منتدى استشارى كطريقة مناسبة لمناقشة المواضيع المعقدة التى أثارتها الورقة. وشدد المشاركون على أهمية تحديد دور الدول الأعضاء والمنظمات والنتائج المتوقعة من المنتدى الاستشارى.
- ثمة حاجة عاجلة الى انشاء وحدة بذور بكل مركز من مراكز البحوث الزراعية أو محطة أبحاث زراعية رئيسية لتكون مسؤولة عن الاتصال مع المزارعين.
- يحتاج العديد من بلدان الاقليم للمساعدة لوضع سياسات قطرية للبذور تتفق وأولويات هذه البلدان وبهدف تعبئة الموارد.
- أدرك الملتقى ضرورة إقامة مشروعات ثنائية وأخرى متعددة الأطراف للعمل معا فى الإقليم، وفى هذا الصدد أبدى العديد من البلدان وخاصة جمهورية إيران الاسلامية استعدادها للتعاون فى هذا المنهج إذا ما دعت الحاجة لذلك.
- وجود نقص فى تبادل المعلومات وحاجة قوية الى تقاسم المعلومات الأساسية.
- أثنى الحاضرون على نوعية المعلومات الواردة فى الورقة المرجعية وأهميتها للملتقى.

٢-٢ خصخصة قطاع البذور فى الشرق الأدنى وشمال أفريقيا

تزايد الاهتمام بدور القطاع الخاص فى البلدان النامية خلال الثمانينات. وتم تشجيع الحكومات على الانسحاب من التدخل المباشر فى الانتاج والتسويق مع التركيز على أمور السياسات. وقد أدرجت عملية الإمداد بالبذور ضمن عملية الخصخصة حيث تعتبر نشاطا "تجاريا"، وعلى الرغم من الأهمية الاستراتيجية للبذور فى الزراعة، فإن من الصعب إقامة أعمال تجارية سليمة تعتمد على الإمداد بالبذور. ولذا فعملية الخصخصة تتطلب إدارة حكومية نشطة وحذرة.

ولتشجيع القطاع الخاص على القيام بدور أكبر فى عملية الإمداد بالبذور، يتعين أولا إعادة النظر فى العقبات التنظيمية والاعانات الحكومية حتى يكون هناك مجال ممهد لعمل كل المشاركين فى قطاع البذور. ومن الممكن أيضا تقديم دعم غير مباشر من خلال خدمات ضمان الجودة وبعض الحوافز المادية. ومع ذلك وحتى رغم وجود بيئة سياسات مناسبة، فإن من الصعب تداول بذور بعض المحاصيل، بحكم طبيعتها تجاريا، ومن بينها بعض الحبوب الغذائية الهامة فى إقليم الشرق الأدنى وشمال أفريقيا (الحبوب والبقول).

وقد تدخل الشركات متعددة الجنسيات قطاع البذور ولكنها شديدة الانتقائية فيما يتعلق بالمحاصيل والمناطق الزراعية. وفى المجال العملى غالبا ما تستفيد المناطق الأكثر حظا فقط من أنشطة هذه الشركات. ولذا، فمن المهم أن تظهر شركات البذور الخاصة المحلية. ولشركات البذور الصغيرة ذات رأس المال وتكاليف الادارة المنخفضة أهمية

خاصة اذا تم تدعيمها فى مرحلة التأسيس. وبينما يزداد قطاع البذور تنوعا، أصبح من المهم وجود منتدى قطري تمثل فيه المصالح المختلفة. وقد يكون انشاء اتحادات قطرية للبذور عاملا ايجابيا فى دعم ظهور القطاع الخاص وتمثيل مصالحه أمام الحكومة.

وتخلص هذه الورقة الى التأكيد على وجود دور مستمر للحكومة للحفاظ على بيئة سياسات مناسبة حتى يستغل القطاع الخاص كل الأجزاء السليمة من الناحية التجارية فى سوق البذور. كما ان بعض جوانب الامداد بالبذور تتطلب تدخل حكومي نشط إذا ما كان الهدف هو استفادة كل المزارعين من النوعيات الجديدة والمحسنة من البذور.

وقد تم وضع بعض النقاط خلال المناقشات أهمها:

- تباين التقدم فى تطبيق الخصخصة تباينا شاسعا فى الإقليم. وينبغى أن يجد الاقليم أساليب مبتكرة للتشجيع على إشراك القطاع الخاص فى نظم الامداد بالبذور.
- ثمة حاجة الى النهوض بقطاع الأعمال الصغيرة المحلية وهو ما يتطلب توفير التدريب على كل المستويات.
- كان هناك قلق بشأن مسؤولية المحافظة على التنوع الوراثى. واقترح الحفاظ على المادة الوراثية الخاصة بالسلالات التجارية أو الأصول.
- ضرورة إيجاد طريق لإشراك القطاع الخاص فى عملية تحسين البذور. وقد أشير الى أنه على الرغم من أن مسؤولية عملية ضمان الجودة تقع على الحكومة، يتعين على الشركات الخاصة أن تدرس، فى الأجل المتوسط، تطبيق خطط داخلية لضمان الجودة كما أعرب عن الحاجة الى التدريب فى مجال ضمان الجودة.
- تأكيد الحاجة الى إشراك الوكالات الدولية والمنظمات غير الحكومية المحلية فى قطاع البذور.
- أبدى الحاضرون تخوفهم من التركيز على اعتبارات الكفاءة على حساب عدالة التوزيع مما يؤدى الى الحد من الخدمات التى تقدم من ذوى الموارد المحدودة فى المستقبل.

٢-٣ إدارة التنوع الوراثى وصيانته واستخدامه فى الشرق الأدنى وشمال أفريقيا

يعتبر الاستخدام المستدام للموارد الوراثية النباتية عنصرا أساسيا فى زيادة كفاءة استخدام الموارد لإنتاج الغذاء. وأدى اعتماد مربى النباتات فى الاقليم على المواد التى وفرتها المراكز الدولية الى الامتناع عن استخدام الموارد الوراثية المحلية فى الاقليم. ولذلك تأثرت عملية صيانة هذه الموارد، وعلى الرغم من تنوع الموارد النباتية، فإن الاقليم لا يحافظ إلا على جزء صغير من التنوع الوراثى النباتى الموجود فيه وغالبا ما يكون فى ظروف غير مرضية وبمعلومات غير كافية. وهناك اختلافات كبيرة بين دول الاقليم فى جهودها لصيانة واستخدام التنوع الوراثى النباتى، ولا يتوافر التوازن المناسب بين الصيانة وقدرات الاستخدام. وتشير التقديرات الى أن هناك أكثر من ثلاثمائة صنف وسلالة محصولية لا

يهتم بها المربون فى الاقليم، ويحتفظ بها المزارعون كأصناف أصلية محلية. ولدعم تنمية صناعة بذور سليمة من خلال الاستخدام المستدام للموارد الوراثية النباتية، طرحت النقاط التالية:

- توفير معلومات عن المجموعات الوراثية المحتفظ بها خارج مواقعها الطبيعية فى الاقليم من خلال توصيف وتقويم هذه المجموعات مع مراعاة أهداف التربية.
- جمع الموارد الوراثية الخاصة ببلدان الاقليم مع تحديد الثغرات فى المجموعات الموجودة حاليا.
- تعزيز التعاون فى مجال التنوع الوراثى النباتى داخل الاقليم وخارجه.
- اتخاذ الاجراءات اللازمة لدعم صيانة واستخدام الموارد الوراثية سعيا الى تصحيح الخلل القائم فى قدرات الصيانة والاستخدام فى بلدان الاقليم.
- إقامة منتدى لتعزيز الجهوج المشتركة بين بلدان الاقليم فى مجال تربية النباتات.

وطرح المشاركون النقاط التالية خلال المناقشات التى تلت ذلك:

- يتعين على المستخدمين والمربين والمزارعين صيانة الموارد الوراثية النباتية. وعلى الرغم من إشراك مربى النباتات فى عمليات الصيانة، فإنهم لا يحافظون إلا على المواد المفيدة لهم فقط.
- من المهم تقليل حجم التآكل الوراثى النباتى فى الاقليم، ويجب اتخاذ كل الخطوات لتحقيق هذا الهدف.
- يمكن، اقتصادا فى التكاليف، حفظ الموارد الوراثية فى بنوك الجينات فى مراكز مختارة لفائدة الاقليم بأكمله – وقد أعرب صانعو السياسات فى الدول المختلفة عن استيائهم من نقص استخدام الموارد الوراثية المحفوظة لدى بنوك الجينات الخاصة بهم.
- أثيرت تساؤلات حول أصناف المزارعين وحقوقهم.
- ينبغى تيسير اعتماد أصناف المزارعين (الأصناف الأصلية) وان كان يبدو أن من الصعب حمايتها قانونا.
- يجب إيجاد طرق ووسائل لتقديم الدعم المالى لأنشطة الحفاظ على الموارد النباتية الوراثية بما فيها حقوق المزارعين.

٤-٢ تحسين صناعة البذور ونقل التكنولوجيا الى المزارعين فى إقليم الشرق الأدنى وشمال أفريقيا

يعتبر نقل التكنولوجيا الى المزارعين من الأمور الهامة لضمان تقدير المزارعين للأهمية القصوى لاستخدام البذور المحسنة للحصول على زيادة الغلات على أسس مستدامة. وتضم قائمة أصحاب الشأن فى عملية نقل التكنولوجيا منظمات الائتمان الزراعى بما فيها البنوك الخاصة التى توفر قروضا قصيرة ومتوسطة الأجل للمزارعين والصانعين وموردى الآلات والمدخلات الزراعية وقطاعات صناعات البذور العامة والخاصة، والمنظمات غير الحكومية وتعاونيات المزارعين. ويحتاج أصحاب الشأن هؤلاء جميعا الى معلومات حديثة عن الأنواع المحسنة ومصادر البذور المحسنة لينصحوا عملائهم بما ينبغى عمله لتحقيق كفاءة استخدام القروض والمدخلات الزراعية.

وتقع المسؤولية الرئيسية لنقل التكنولوجيا على كاهل أقسام الارشاد الزراعي في وزارات الزراعة القطرية أو المحلية. ولم تجر أية محاولات في بلدان الاقليم لإجراء تغيير جذرى في أسلوب نقل التكنولوجيا عن طريق إسناد دور أكبر للقطاع الخاص ومنظمات المزارعين. وتعتبر عملية نقل التكنولوجيا من خلال مؤسسات الأبحاث ذات أهمية خصوصا في حالة المؤسسة البحثية المتخصصة في محصول معين (مثل مؤسسات أبحاث الأرز). ويمكن أن يصبح القطاع الخاص ذو فاعلية كبيرة في نقل التكنولوجيا إذا ما كانت المعلومات تساندها قروض مصرفية ومدخلات لتمويل التكنولوجيا المحسنة الى انتاج واقعي في المزارع. ولا توجد تقريبا أى بحوث في مجال علم البذور في حد ذاته في معظم مراكز البحوث الزراعية القطرية في الاقليم ولذا يتعين التركيز على هذا المجال. ولزيادة الإمداد بالبذور الجيدة يجب بذل الجهود لدعم انتاج القطاع الخاص من البذور من خلال الحوافز المناسبة. كما يجب تقوية الروابط بين البحوث وقطاع البذور غير الرسمي لتحسين الامداد بالبذور المحسنة واستخدامها.

ولا تعتبر عملية نقل التكنولوجيا من خلال أجهزة الارشاد التابعة للقطاع العام فعالة بالدرجة الكافية. ويجب تركيز دور هذه الأجهزة وتعريفه بصورة أكثر تحديدا، وتحسين الهيكل الوظيفي للعاملين بالارشاد الزراعي وربطه بالانجازات. كما يجب أن تكون هناك صلات أفضل بين منظمات البحث والارشاد حتى يتم إمداد الموظفين دائما بالمعلومات الحديثة عن التكنولوجيا الجديدة. ويجب أن تجرى مؤسسات الأبحاث المتخصصة في المحاصيل عملية نقل التكنولوجيا كجزء من الأعمال المكلفة بها وأن تؤسس رابطة ثنائية الاتجاه مع المزارعين. ويعتبر نقل التكنولوجيا من خلال القطاع الخاص وبخاصة تجار المدخلات الزراعية وموردى البذور والمنظمات غير الحكومية وتعاونيات المزارعين وسيلة فعالة ويمكن تحسينها من خلال ربطها بصورة أفضل بالمؤسسات البحثية لزيادة معرفتهم بطريقة مستمرة.

وقد طرحت بعض النقاط خلال المناقشات التالية:

- يتم صرف أموال كثيرة على استنباط أصناف جديدة لا يتم استخدامها بطريقة سليمة بسبب عدم كفاية خدمات الإرشاد. وأشار بعض المشاركين الى أن محطات ومؤسسات البحوث يمكن أن تقوم بعمل أفضل من أجهزة الإرشاد الزراعي الموجودة حاليا في مجال نقل المعارف الى المزارعين.
- قد يكون نقل المعارف والتكنولوجيا على أساس كل سلعة أو مكان محدد أنسب وأكثر فعالية من عمليات النقل العامة للتكنولوجيا.
- إدراج دورات عن علم البذور في المقررات الدراسية للجامعات ومعاهد الدراسة يزيد من عملية نقل المعارف.

٢-٥ تشريعات البذور وتدابير في الشرق الأدنى وشمال أفريقيا

لا تغطي التشريعات الخاصة بالبذور في بلدان الشرق الأدنى وشمال أفريقيا جميع الجوانب الخاصة بإطلاق الأصناف ومراقبة جودة البذور وتسويق البذور وتوزيعها. وعلاوة على ذلك، كانت التشريعات الموجودة مرضية في عدد

من البلدان إلا أنها غير موجودة من الناحية العملية فى كثير من البلدان الأخرى. وتغطى التشريعات، فى بعض البلدان، عمليات استيراد بعض المحاصيل الغذائية وخصوصا الخضر التى تزرع بالرى والبذور المهجنة (الذرة وعباد الشمس). وهناك حاجة لصياغة العمليات التى تنظم وتيسر التجارة الحرة بالبذور وتحسين نظم التبادل المحلية للبذور. ويعتمد فى بعض البلدان على النظم غير الرسمية فى إمدادات معظم البذور.

ويندر وجود التشريعات الخاصة بحقوق الملكية الفكرية وحماية التنوع النباتى فى الاقليم، ومن ثم فإن صياغة هذه التشريعات سوف تؤدى الى تزايد الاستثمارات وتشجع التقدم فى تحسين المحاصيل الزراعية، حيث تجرى حماية جميع أصحاب الشأن (المزارعون والعلماء والمستثمرون).

يعتبر المزارعون ومعهم نظم إنتاج البذور القطرية المصدر الرئيسى لبذور الحبوب، والحبوب العلفية. وهناك طرق يمكن بها تطبيق حقوق المربين فى الاقليم لزيادة المستحدثات وتحقيق التقدم فى عملية استنباط أنواع محسنة مع حماية حقوق المزارعين فى نفس الوقت. ويمكن باتباع النظام المقبول لدى الاتحاد الدولى لحماية الأصناف النباتية الجديدة والاتحاد الأوروبى اتاحة الفرصة لصغار الحائزين (الذين ينتجون أقل من ١٠٠ طن من الحبوب) بإنتاج البذور المسجلة لاستعمالهم الخاص مع عدم التصريح لهم بالمتاجرة فيها.

وسوف تتحسن عملية حصول المزارعين على الأصناف المحسنة بعد الموافقة على اتفاق الجوانب المتعلقة بالملكية الفكرية فى التجارة جنبا الى جنب مع تسجيل الأصناف، وحماية الموارد الوراثية النباتية وإنتاج البذور وتجارتها، ويمكن أن تصبح التشريعات التى وضعت على أساس الخطوط التوجيهية للاتحاد الأوروبى والاتحاد الدولى لحماية الأصناف الجديدة الأساس لإقامة قاعدة انتاج وتوزيع البذور فى دول الشرق الأدنى وشمال أفريقيا. ومع ذلك هناك بعض الجوانب المميزة لهذا الاقليم منها انخفاض الانتاجية، وصغر حجم المساحات، وقلة المدخلات، والحاجة إلى حماية حقوق المزارعين والعمل فى نفس الوقت على تحسين فرص حصولهم على الأصناف النباتية الجديدة، يتعين أخذها فى الاعتبار قبل تطبيق تشريعات جديدة. ويمكن أن تساعد منظمة الأغذية والزراعة البلدان على تحسين واستكمال تشريعاتها من خلال وضع المبادئ العامة المبنية على الاتفاقات الدولية وخبرات الاتحاد الأوروبى والتى يمكن مواءمتها لتصلح للظروف السائدة فى كل من بلدان اقليم الشرق الأدنى وشمال أفريقيا.

وطرح المشاركون بعض النقاط خلال المناقشات التالية:

- حقوق الملكية الفكرية وتشريعات حماية الأصناف النباتية ضروريان لتطوير تربية النباتات وإنتاج وتجارة البذور. وعلى الحكومات لدى إعداد هذه التشريعات أن تسعى للتعاون مع القطاع الخاص حتى يمكن تقليل المشكلات فى المستقبل أو حلها بسهولة.
- على الحكومات أن تركز جهودها على زيادة استخدام البذور المسجلة، وحيث أن موارد الحكومة محدودة فإنه يجب على القطاع الخاص أن يضطلع بدور أكثر فاعلية (بما فيها عمليات فحص واختبار البذور) بينما يكون دور الحكومة أساسا فى العمليات التنظيمية.

- تأكيد الحاجة الى مساعدات فى عمليات اختبارات الأصناف وصياغة التشريعات الجديدة.
- أهمية تحقيق الاتساق بين القوانين والقواعد الخاصة، فهذا مجال يمكن منه توثيق التعاون وإقامة الآليات اللازمة. وقد نوقشت المشكلات التى تعترض تحقيق الاتساق بين قوانين البذور وتشكل مشكلات الصحة النباتية حواجز رئيسية أمام التجارة الدولية بالبذور.
- للمساعدات من المنظمات الدولية والاقليمية تأثير ايجابى على جهود تحقيق الاتساق بين التشريعات.

٢-٦ التعاون الاقليمى وشبه الاقليمى فى قطاع البذور فى الشرق الأدنى وشمال أفريقيا

تعتبر البذور عالية الجودة من العناصر الرئيسية للتنمية الزراعية المستدامة والأمن الغذائى. ومع ذلك فإن البذور مازالت تحتل مكانا هامشيا فى التنمية الزراعية فى إقليم الشرق الأدنى وشمال أفريقيا. ونظم الإمداد بالبذور المحلية تنقصها الكفاءة، وصلتها واهية بصناعة البذور العالمية. كما تعد نظم الإمداد بالبذور المحلية على درجات مختلفة من التطور من حيث الهيكل التنظيمى، والسياسات واللوائح وتكنولوجيا اعتماد البذور، وتوافر الكوادر المدربة وإدارة التنوع الوراثى. كما تتفاوت عمليات التربية واختبارات الأصناف بين الضعف والقوة فيما بين الدول. ومشاركة المزارعين ضعيفة فى استنباط الأصناف وهو الأمر الذى يعد ضروريا لتحسين البذور. وتتضمن العوائق التى تحول دون مشاركة المزارعين ضعف استنباط الأصناف المحسنة. وقلة استخدام هذه الأصناف عند انتاجها، وضعف الروابط بين المؤسسات بالإضافة الى السياسات والقواعد التى يعوزها الاتساق. وبالرغم من التماثل بين نظم الزراعة والسياسات الاقتصادية وإمكان تنمية العديد من المحاصيل المشتركة فى الإقليم مازال التعاون ضعيفا.

يمكن توثيق التعاون الإقليمى عن طريق:

- تحسين طرق إنتاج البذور، بما فى ذلك استنباط الأصناف وإكثار البذور والتجهيز والتوزيع والتسويق.
- تجانس تشريعات البذور لتسهيل إنتاج البذور والتجارة الإقليمية والاهتمام بالصحة النباتية.
- تحقيق الاتساق بين سياسات البذور.
- إضفاء الطابع المؤسسى على روابط انتاج البذور على المستويات المحلية وشبه الاقليمية والاقليمية.

وتشمل الترتيبات المؤسسية للتعاون إقامة المنتديات الاستشارية. وينبغى لقطاعات البذور أن تعزز من اتصالاتها بالمنظمات الدولية. ويتعين إقامة الروابط الإقليمية القادرة على القيام بمزيد من المهام والرامية الى تحسين الاتصالات فيما بين بلدان الإقليم والمساهمة بصورة جماعية فى قيام منتدى إقليمى قوى للبذور.

ومن خلال المناقشات ظهرت النقاط التالية:

- الحاجة الى وضع نموذج لقانون بذور لتسهيل الانتاج والتجارة عبر الإقليم كما يجب أن يعمل القانون على تسهيل مشاركة كل القطاعات المعنية.
- تحقيق الاتساق بين تشريعات البذور يتطلب تحليل القواعد المعمول بها فى البلدان المختلفة.

- جرى التشديد على دور الروابط المعنية بالبذور فى ممارسة الضغط على الحكومات. وينبغى زيادة كفاءة المنتديات الاقليمية وشبه الاقليمية العاملة فى مجال معالجة هذه الموضوعات النوعية.
- يتعين لتحقيق التجانس اجراء تقييم متعمق للأوضاع فى كل بلد. وينبغى للمنظمة أن تساعد فى ذلك التقييم وقد اقترح إنشاء منظمة أو هيئة جامعة لتنسيق نشاطات التجانس.
- ثمة ضرورة ملحة لإنشاء الآليات اللازمة لجذب انتباه صانعى السياسات الذين يشاركون فى القرارات الخاصة بتحقيق التجانس.
- التشريعات القطرية الواقعية والعملية ضرورة لتحقيق التعاون الإقليمى المتسم بالكفاءة.
- ثمة حاجة عاجلة لتنمية الموارد البشرية فى مجال علم البذور والموضوعات المتعلقة به.

٢-٧ تقييم عملية انتاج بذور محاصيل الخضر وتسويقها فى الشرق الأدنى وشمال أفريقيا

تأتى أهمية محاصيل الخضر من اتساع المساحات المزروعة والدخل النقدى المرتفع بالمقارنة بالمحاصيل الأخرى. غير أن انتاج محاصيل الخضر يتباين كثيرا فيما بين بلدان الاقليم وذلك إما لانخفاض نوعية البذور أو لاستخدام النباتات التى جرى تربيتها فى مناطق مناخية مختلفة. والعامل الأخير يؤكد ضرورة استخدام البذور المنتجة خصيصا للإقليم. وهناك بصفة عامة ندرة فى المعلومات عن إنتاج وإمداد بذور الخضر فى الإقليم. وبالرغم من انخفاض الإنتاجية فى العديد من السلالات والأصناف المحلية بالمقارنة بالسلالات المنهجية المستوردة، فإن ما يميزها هو المذاق الخاص، ومقاومتها للأمراض ومقدرتها على مقاومة الإجهاد البيئى، وقد تؤدى الجهود المبذولة لتحسين الأصناف المحلية الى زيادة الإنتاجية مع الإبقاء على التكيف مع الظروف المحلية.

وتكمن العقبات التى تواجه البذور فى: (أ) النقص فى المساعدات المالية اللازمة للبحوث المتعلقة بإنتاج بذور المربين؛ (ب) والقصور الشديد فى عدد الفنيين اللازمين لدعم برامج التربية، والنقص فى المواد والأدوات المطلوبة لإنتاج وتخزين البذور؛ (جـ) والصعوبة فى تبادل المواد النباتية بين البلدان، وعدم وجود مزارع تربية تخضع لمعايير موحدة مما يؤدي الى إنتاج نوعيات رديئة من البذور.

ولم يضع سوى عدد قليل من بلدان الإقليم خططا واضحة لتقوية قطاع بذور الخضر بينما تباطأت معظم البلدان فى إنشاء بنوك جينات قطرية أو مرافق مركزية لمجموعات الموارد الوراثية النباتية. ولم تبدأ بعض البلدان إلا فى السنوات القليلة الماضية فى إنشاء تلك البنوك أو شرعت فى هذا الاتجاه. وقد كانت مشاركة القطاع الخاص المحلى فى صناعة بذور الخضر محدودة للغاية فى العقد الأخير. لذا يجب العمل على إشراك القطاع الخاص وتشجيعه لأخذ المبادرة فى إنتاج بذور الخضر، ومن الأفضل أن يتم ذلك من خلال مشروعات مشتركة التمويل كما يقترح أيضا تحسين برامج التربية المحلية والإقليمية.

ومن خلال المناقشات التالية بين المحاضرين طرحت النقاط التالية:

- التأكيد على ضرورة مشاركة القطاع الخاص.

Copyrighted material

- منافسة البذور المستوردة تستدعى الاهتمام بإقامة مشروعات مشتركة.
- ضرورة تسهيل قواعد تسجيل الأصناف الخاصة بالقطاع الخاص، ولكن يجب على القطاع الخاص توفير الوثائق اللازمة الخاصة بتوصيف الأصناف والمعلومات الفنية الأخرى المطلوبة.
- التأكيد على أن نوعية البذور عامل أساسى لزيادة الإنتاج فى مزارع الخضر.

٢-٨ إنتاج بذور الأعلاف والمراعي والإمداد بها في الشرق الأدنى وشمال أفريقيا

ترجع أهمية المراعى الدائمة وأراضى المراعى المزروعة والمراعى الطبيعية إلى أنها تمثل الإمكانيات القوية لإنتاج الثروة الحيوانية فى الشرق الأدنى وشمال أفريقيا. غير أن نجاح برامج تحسين المراعى وعمليات إنتاج العلف يعتمد على عوامل عديدة من بينها، العامل الأساسى المتمثل فى وجود البذور الكافية والجيدة فى الوقت المناسب.

فقطاع بذور المراعى والأعلاف يتعرض لنوعين من المعوقات. المجموعة الأولى تخص قطاع البذور والثانية لها علاقة بتطوير أنشطة تحسين المراعى على وجه العموم. وعلاوة على ذلك، فإن الضغوط السكانية فى بعض البلدان والتى تتمثل فى الطلب المتزايد على المنتجات الزراعية والحيوانية أدت الى إسراف المزارعين فى استخدام موارد الأعلاف مما أدى الى الرعى الجائر ثم الى تحول الأراضى الى أراضى زراعية حدية.

ومن خلال المناقشات التالية تم التركيز على النقاط التالية:

على المستويات الفنية والمؤسسية والمتعلقة بالسياسات:

- وضع الاستراتيجيات القطرية وخطط تنمية بذور المراعى والأعلاف.
- تحفيز القطاع الخاص على المشاركة فى إنتاج بذور المراعى والأعلاف.
- تكثيف البحوث فى إنتاج البذور وبالأخص فى إنتاج بذور المراعى والأعلاف.
- التنسيق بين الأبحاث والإرشاد وإنتاج البذور.
- وضع برامج الأبحاث الحقلية بمشاركة مزارع إنتاج البذور
- تشجيع التكامل بين نظم إنتاج البذور الرسمية وغير رسمية.
- وضع تشريعات وقواعد للبذور فى محاصيل الأعلاف والمراعى.
- تكثيف التدريب قصير الأجل للمزارعين ومجموعات الإرشاد.

على المستوى الإقليمى:

- تقوية الشبكات الموجودة التى تتعامل مع إنتاج بذور المراعى والأعلاف فى الإقليم. مع دعم عملية تبادل المواد النباتية والخبرات والمعلومات المتصلة بالمراعى وبذور الأعلاف.

- تدعيم نشاطات المعاهد والمراكز العالمية مثل منظمة الأغذية والزراعة والمعهد الدولى للموارد الوراثية النباتية والمركز الدولى للبحوث فى الأراضى الجافة والمركز الدولى للدراسات الزراعية المتقدمة فى البحر المتوسط ذات الصلة بالتدريب والأبحاث المشتركة فى الإقليم.

كما ظهرت النقاط التالية خلال المناقشات:

- تعتبر بذور العلف من المنتجات الثانوية ولذا فإنها غير جاذبة ولم تعر الاهتمام الكبير لتطويرها، بالاضافة الى أن اهتمام القطاع الخاص بها محدود.
- لم تأن بعد خصخصة قطاع إنتاج بذور الأعلاف نتيجة لاعتبارات اقتصادية واعتبارات أخرى.
- اقتراح أن تساهم المنظمة فى وضع تشريع نموذجي، وأن يقوم كل بلد فى الإقليم بمراجعتها تبعا لظروفه واحتياجاته. إلا أنه يجب البدء بتوفير الخطوط العريضة لذلك.
- ضرورة اتخاذ خطوات بشأن الجوانب الفنية والمؤسسية والمتعلقة بالسياسات فى عملية الإمداد ببذور الأعلاف بالإضافة الى المستوى الإقليمي.
- أن تتضمن المساعدات المقدمة من المراكز والمعاهد العالمية (المنظمة والمركز الدولى للبحوث فى الأراضى الجافة والمعهد الدولى للموارد الوراثية النباتية) التدريب والأبحاث المشتركة ومنح الاستشارات القانونية وخلافه وإقامة الشبكات المعرفية المعاونة وغير ذلك.

٢-٩ السياسات والاستراتيجيات القطرية للبذور فى الشرق الأدنى وشمال أفريقيا

تتولى الحكومات مسؤولية ضمان الإمدادات الكافية من الأغذية بسعر مناسب وتقوم السياسات التى تنتهجها الحكومات بتحفيز تنمية قطاع الزراعة. ونظرا لضرورة توفير الحد الأقصى من الفعالية بأقل تكاليف للموارد القطرية، يسند اهتمام كبير لتوفير الأصناف المحسنة وبخاصة فى وقت الزيادة السريعة فى السكان والتكيف الهيكلي للإقتصاد، والحاجة الى الاستخدام الأمثل للموارد. ويمكن القول، بصفة عامة، بأن السياسات والاستراتيجيات المتبعة خلال الخمسين عاما الماضية لم تؤد الى نتيجة لتفعيل دور قطاع البذور الرسمى لمواجهة متطلبات المزارعين ذوى الموارد المحدودة من المحاصيل الغذائية الهامة. حيث مازالت نسبة البذور من الأصناف المحسنة التى يمدها قطاع البذور الرسمى محدودة للغاية.

وناقشت الورقة أهمية وضع سياسة قطرية للبذور تكون مؤثرة وحديثة وطويلة الأجل وواقعية ومؤيدة باستراتيجيات كافية لإقرار تنفيذ هذه السياسات. ويتعين إنشاء مجلس قومى للبذور أو آلية مماثلة لصياغة السياسات والاستراتيجيات اللازمة لمستقبل قطاع البذور. كما أنه يشكل الهيكل الذى من خلاله يتم تحقيق الأهداف والسياسات بصورة مستدامة.

Copyrighted material

وفيما يتعلق بالخصخصة، يتعين على الحكومات خلق سوق للبذور وتوفير البيئة المناسبة لازدهار القطاع الخاص. وقد اقترحت الورقة عددا من العوامل التى تساعد فى ذلك. وناقشت الورقة بإيجاز السياسات الرامية الى اشراك قطار البذور غير الرسمى وانتهت الى أهمية دعم هذا القطاع بالصورة التى يصبح بها مساعدا فى النهاية على التحول لقطاع رسمى. كما ناقشت الورقة إشراك عمليات تربية النباتات ومدى الحاجة لشركات البذور الصغيرة منخفضة التكاليف الادارية.

وانتهت الورقة الى ضرورة مناقشة موضوع الإغاثة بالبذور فى أوقات الطوارئ. ويعد حسن الاستعداد هو القضية الرئيسية. ويتمثل العنصر الرئيسى لأى استراتيجية لزيادة أمن البذور فى توفير المعلومات التى تؤدى الى سرعة التصرف فى حالات الطوارئ. ويمكن أن تتضمن الاستراتيجية أيضا: (أ) المبادرة بعمل مخزون قطرى وإقليمى لأمن البذور، (ب) تقوية صناعات البذور المحلية فى الاقليم لضمان توافر البذور فى حالات الكوارث، كما تضمن إنتاج بذور جيدة كرصيد للأمن، (جـ) دعم التعاون الإقليمى، (د) تحقيق الاتساق بين سياسات وقواعد البذور القطرية، (هـ) تقييم الأصناف على المستوى الإقليمى.

خلال المناقشات التالية بين الحاضرين ظهرت النقاط التالية:

- الإشارة الى أن تطوير إنتاج البذور لم يكن فى المستوى المتوقع، والسبب الرئيسى فى ذلك هو أنه لم يكن موجها نحو السوق وإنما كان أساسا وفقا للتكنولوجيا المتاحة، وعلى هذا يجب على الحكومات خلق سوق للبذور.
- المزارعون يتميزون بالحساسية فى عملهم وأنهم سيؤدون العمل بصورة أفضل إذا تم تدريبهم. كما يجب وضع حوافز للاستثمارات الصغيرة بدون تدخل الحكومة بصورة مبالغ فيها.
- التأكيد على الاهتمام بتدريب المزارعين.
- لوحظ أن بعض البلدان لم تعط للقطاع الخاص الفرصة لإنتاج البذور لأسباب سياسية.
- أهمية أن تدعو السياسات القطرية الى التجانس، وأن يتم تطوير الآليات اللازمة بحيث يعلم كل بلد بالتطورات الحادثة فى البلدان الأخرى فى الاقليم، وكمثال لذلك الاحياء بالبذور، والإغاثة بالبذور.
- ضرورة إيجاد مناخ اقتصادى ملائم بالاضافة الى برامج ترويج الاستثمار وحوافز حكومية لتشجيع الاستثمارات الخاصة.
- أن تطوير قطاع البذور غير الرسمى سوف يؤدى الى تنمية قطاع البذور الرسمى.

٢-١٠ المناقشة العامة

يعد إقليم الشرق الأدنى وشمال أفريقيا من أكبر المستوردين للحبوب كغذاء، وتتناقص نسبة الاكتفاء الذاتى فيه بمعدل ١٪ سنويا على المستوى الإقليمى. ومع ذلك مازالت الزراعة هى القطاع الأكبر الذى يعتمد عليه الاقتصاد فى بلدان كثيرة، وتعتبر ذات أهمية خاصة كمصدر رزق لسكان الريف كما تسهم فى التنمية الاقتصادية المتوازنة والاستقرار

Copyrighted material

الاجتماعى. وتعتبر البذور من العوامل الأساسية فى التنمية الزراعية من ناحية تأكيد إمكانية المزارعين الحصول على أكثر الأصناف تناسبا مع ظروفهم.

وتعد الحبوب والبقوليات من المحاصيل الغذائية الرئيسية فى الاقليم. ولذا يجب أن يحصل المزارعون على بذورها كل عام مجددا. وفى غالبية المناطق التى تعتمد على مياه الأمطار لا يزرع إلا محصول واحد كل عام وتكون غلته منخفضة. ويتاح الرى فقط فى بعض البلاد إلا أن المياه تعتبر عنصرا مقيد للإنتاج على اتساع الإقليم.

وبسبب وجود أسواق حضرية جيدة وكثيرة، تعتبر المحاصيل ذات القيمة النقدية الفعالية مثل الخضر والفاكهة ذات أهمية كبيرة. والانتاج المكثف كعلف للحيوان وللبيع نقدا فى المناطق الحضرية يعتبر جزءا هاما من الانتاج الزراعى.

وعلى الرغم من هذه الأهمية القصوى للإنتاج الزراعى فى الإقليم، فإن الوضع الحالى لمصادر البذور غير مرض. ولا يتم عادة استيفاء احتياجات المزارعين من البذور المنتقاة (البذور الجيدة والأصناف). هناك أيضا تأخير فى توصيل الأنواع الجديدة الى المزارعين، وفى كثير من الحالات لم يكن لدى المزارعين إلا حدودا ضيقة للاختيار بين الأصناف. وبالإضافة الى ذلك حظيت المحاصيل الأكثر خصوصية فى الإقليم بقدر ضئيل جدا من الاهتمام.

ويواجه القطاع خليطا من المعوقات الفنية والاقتصادية والمتعلقة بالسياسات. وعلى وجه الخصوص لا يتوافر الإدراك الكافى بأهمية البذور من قبل صانعى السياسات ولا بالحاجة لتحديث السياسات لمراعاة المتغيرات الحادثة فى سوق البذور العالمية.

ويتطلب الضغط على البيئة فى كثير من أجزاء الإقليم إدارة دقيقة لتحقيق إنتاجية زراعية دون تدمير قاعدة الموارد الطبيعية. ولهذا السبب يجب أن تحصل بذور الأعلاف ومحاصيل العشب على الاهتمام بالإضافة الى البذور الغذائية.

المواضيع الأساسية التى تم مناقشتها

وفى ضوء ما تقدم والمعلومات الأساسية التى قدمت من خلال الأوراق المواضيعية، نوقشت الموضوعات النوعية التالية.

٢-١٠-١ الحاجة الى آلية للتعاون الإقليمى ودون الإقليمى فى قطاع البذور، يكون له الأهداف العامة التالية:

- وجود تركيز محسوس لكل الجهود لتقوية قطاع البذور.
- وجود منتدى لتبادل المعلومات والخبرات.
- وجود آلية لتسهيل تعبئة الدعم والموارد.

- وجود عنصر وسيط لتسهيل المشروعات الرائدة والكبيرة والتى تتقدم بإسهام قوى لقطاع البذور فى بلدان الإقليم منفردة أو مجتمعة.

٢-١٠-٢ الموضوعات الاستراتيجية:

- وجود سياسات واستراتيجيات قطرية للبذور تقوم بتوصيف دور القطاعين العام والخاص.
- تحقيق الاتساق فى تشريعات البذور والقواعد المنظمة بما فى ذلك قواعد صحة النبات من الأمراض الكامنة بالبذور.
- الاستخدام الكفء للموارد النباتية الوراثية المتاحة.
- أمن البذور.

٢-١٠-٣ البحث، التدريب، نقل التكنولوجيا

- العمل على تحسين تمثيل تكنولوجيا البذور فى مناهج الجامعات ومعاهد التعليم الأخرى لزيادة الوعى بقطاع البذور بين كل الخبراء والفنيين الزراعيين.
- تنمية الموارد البشرية عامة وبخاصة التدريب العملى فى كل الأنشطة المرتبطة بالبذور.
- زيادة الاهتمام بالبحث فى علم البذور وتحسين الاتصال بين قطاع البحوث وقطاع البذور.
- تعظيم الجهود لكل العاملين بالإرشاد لضمان الانتشار الفعال للمعلومات حول الأصناف الجديدة والبذور المحسنة.

٢-١٠-٤ النشاط المطلوب لمجموعات العمل المحصولية المتخصصة

- الحاجة الى معلومات أفضل عن مصادر البذور ومواد الزراعة للمحاصيل البستانية والأعلاف.
- الحاجة الى التركيز على الإنتاج وتحسين المواد المحلية المتأقلمة.
- إجراء بحوث عن إجراءات الإنتاج لتعظيم الغلات وتحسين نوعية البذور مع زيادة القدرة التنافسية للإنتاج المحلى.
- الحاجة الى تبادل المعلومات والخبرات داخل الإقليم من خلال الترتيبات والمشروعات الثنائية والمتعددة الأطراف بمساندة الوكالات الدولية.

٢-١٠-٥ الدعم من الجهات المتبرعة

عبر مندوب GNIS (فرنسا) عن رغبته فى البحث عن دعم مالى من الوكالات الحكومية للعمل على تطوير قواعد البذور وإدارة معلومات البذور فى منطقة الشرق الأدنى وشمال أفريقيا فى حالة ما إذا كانت هذه الأنشطة جزءا من برنامج فنى قوى تحت إشراف المنتدى الاستشارى.

Copyrighted material

٣ - التوصيات

المنتدى الاستشارى الإقليمي لسياسات وبرامج البذور فى الشرق الأدنى وشمال أفريقيا

اقترح الاجتماع ووافق على إنشاء منتدى استشارى إقليمي لسياسات وبرامج البذور فى الشرق الأدنى وشمال أفريقيا وقد طلب وضعه تحت رعاية منظمة الأغذية والزراعة. وسيكون المنتدى مفتوحا لكل البلدان المهتمة بتحسين وتطوير قطاع البذور والموارد الوراثية النباتية فى الإقليم. وسوف يسهل المنتدى التعاون العلمى بين البلدان لإنتاج البذور، ودعم إنتاج البذور، بدعم من المؤسسات والجهات ذات الصلة لتنمية الموارد الوراثية النباتية وحفظها واستخدامها. وسيعمل المنتدى مبدئيا على أساس طوعى حتى يتم تصميم وضع رسمى له. ويتم الموافقة عليه من قبل الحكومات الأعضاء. وسيتكون المنتدى الاستشارى من مؤسسات من كل بلد من البلدان الأعضاء، والمؤسسات الدولية النشطة فى قطاع البذور فى الإقليم، وممثل لمنظمات تجارة البذور أو إحدى شركات البذور فى حالة عدم وجود منظمات قطرية بالإضافة الى أشخاص مدعوون.

وقد سمى المنتدى المقترح بالمنتدى الاستشارى للبذور فى الشرق الأدنى وشمال أفريقيا .((CFS-NENA) Consultative Forum on Seed in the Near and Notrh Africa)

وسوف يتم تدعيم المنتدى بمجموعات عمل علمية وفنية متخصصة لمعالجة الموضوعات العلمية الإقليمية ذات الطبيعة الصعبة. وسوف تربط هذه المجموعات المتخصصة المبادرات الخاصة بالبذور فى الأنحاء المختلفة فى الإقليم بالمنتدى الإستشارى/ والذى سيؤدى الى وصل الإقليم بالمبادرات الإقليمية الأخرى عن تطوير البذور وصيانة الموارد الوراثية النباتية واستخدامها.

وسيلعب المنتدى الاستشارى أيضا دورا فى تحقيق الاتساق والقوة لشبكات المعلومات الحالية فى قطاع البذور وتحسين المحاولات الجديدة على المستويين القطرى وشبه الإقليمي. وفى هذا المقام اتفق على ضرورة انضمام الشبكات الحالية العاملة فى مجال البذور والموارد الوراثية النباتية مثل (شبكة بذور WANA وPGR-WANANET) إلى المنتدى.

ويشجع المنتدى اشتراك الدول والمؤسسات والمنظمات المهتمة بالمساهمة فى هذه المبادرة.

وأوصى الاجتماع بأن تقوم منظمة الأغذية والزراعة، باستكشاف إمكانية المساعدة فى تأسيس المنتدى وبدء نشاطاته على أن تقدم الدعم والتوجيه للقضايا الفنية المتعلقة بالسياسات واستكشاف مدى إمكانية توفير الدعم المالى لأنشطة المنتدى الاستشارى.

تنسيق واستراتيجية المنتدى الاستشارى

سيعقد الاجتماع العام للمنتدى الاستشارى كل عامين وسيرأسه رئيس ونائب رئيس يتم انتخابهما من قبل الاجتماع. وسيعقد الاجتماع الأول عام ٢٠٠١، وقد عرضت قبرص أن تستضيف الاجتماع العام الأول.

وقد أنشئت لجنة تنسيق مؤقتة لتعمل فى تعاون وثيق مع منظمة الأغذية والزراعة للمحافظة على قوة الدفع التنظيمية للقيام بالأنشطة الخاصة بتأسيس المنتدى الاستشارى. وستتكون لجنة التنسيق المؤقتة من منسق عام ومنسقى مجموعات العمل الستة الذين يتم تعيينهم عند إقرار تقرير الاجتماع. وسيتم تحديد تاريخ ومكان الاجتماع الأول للجنة التنسيق المؤقتة بعد استشارة منظمة الأغذية والزراعة. وقد رؤى أن تنهى هذه اللجنة أعمالها لدى إتمام الاجتماع الأول للمنتدى.

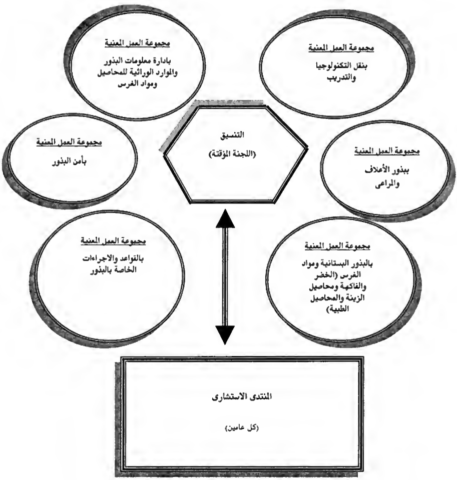
وقد تم تحديد ست مجموعات عمل للقيام بالأعمال العلمية والفنية اللازمة لتطوير قطاع البذور فى الإقليم، ويرأس كل مجموعة عمل منسق.

وتقوم مجموعات العمل بعقد لقاءات بشأن نقاط فنية محددة، على أن يتم ربط هذه اللقاءات مع مؤتمرات أو حلقات دراسية أخرى دولية أو قطرية وذلك كوسيلة لتسهيل مشاركة المجموعة فيها.

ويجب أن يؤكد منسقو كل المجموعات موافقتهم بصور رسمية الى اللجنة المؤقتة مع إرسال نسخة الى إدارة البذور والموارد الوراثية النباتية فى منظمة الأغذية والزراعة (Dr. Menini, AGPS) **فى غضون ثلاثة أشهر**.

وستخضع مسؤوليات التنسيق لمراجعة دورية فى كل اجتماع للمنتدى الاستشارى ويتم التعديل كلما دعت الحاجة لذلك، مع مراعاة ضرورة أن يحصل كلا من المنتدى الاستشارى ومجموعات العمل على الدعم والقيادة المطلوبة. ومن هذا المنطلق ستحال الأسئلة المتعلقة بأداء مجموعات العمل الى اللجنة المؤقتة التى ستتخذ إجراءات مؤقتة لضمان حسن سير العمل.

يرد هيكل المنتدى الاستشارى فى هذا الرسم البيانى



٣-١ دور ووظائف لجنة التنسيق المؤقتة والمنتدى الاستشارى

٣-١-١ لجنة التنسيق المؤقتة

تقوم لجنة التنسيق المؤقتة بمجموعة من المهام لإقامة المنتدى الاستشارى والتى تتضمن الأعمال التالية:

- الاتصال بكل الدول والمنظمات الدولية فى الإقليم بالتشاور مع منظمة الأغذية والزراعة وللتأكد من اهتمامهما بالاشتراك فى المنتدى.
- تجهيز معلومات لإيضاح دور المنتدى المقترح وتعميم ذلك على الأطراف المهتمة ويتضمن ذلك موقع على الإنترنت بالاشتراك مع منظمة الأغذية والزراعة.
- تجهيز مسودة دستور للمنتدى مع مراعاة التوصيات التى تم إقرارها فى اجتماع قبرص والتى سيوافق عليها عند الاجتماع التأسيسى للمنتدى.
- التحضير للاجتماع التأسيسى للمنتدى.
- تنسيق أنشطة مجموعات العمل المختلفة.
- تشجيع اللقاءات المتخصصة عن الموضوعات الفنية
- تشجيع الجهود للحصول على دعم مالى من الجهات المتبرعة ووكالات التمويل لأنشطة المنتدى ومجموعات العمل.

٣-١-٢ المنتدى الاستشارى

سيكون المنتدى الاستشارى مسؤولا مستقبلا عن كل الأنشطة الموضحة أدناه وأى مسائل أخرى لها صلة بالموضوع:

- تسهيل الاتصالات بين مجموعات العمل المختلفة وبين الشبكات الإقليمية القائمة للبذور والمصادر الوراثية النباتية.
- تسهيل تبنى ترتيبات العمل الخاص بالمنتدى بحيث توفى باحتياجات الأعضاء وتأكيد كفاءة العمليات.
- التعاون للتعرف على الإمكانية وللحصول على الدعم المالى من الجهات المتبرعة والوكالات المالية لتقوية أنشطة المنتدى.
- المشاركة بنشاط فى الموضوعات والإجراءات الخاصة بالمبادرات الإقليمية الأخرى والمنتديات تحت مظلة منظمة الأغذية والزراعة والمؤسسات الاقليمية الأخرى ذات الصلة والمهتمة بسياسات وبرامج البذور.
- مراقبة تنسيق مجموعات العمل وهيكل إدارة المنتدى الاستشارى بعد إقرار حالته الرسمية.
- المساعدة فى وضع مشروعات وسياسات البذور القومية.
- تقديم الدعم الاستشاري للدول الأعضاء.

ولتسهيل الاتصالات العامة والمشاركة فى المعلومات، تم الاتفاق على انشاء موقع أو أكثر من موقع على الانترنت وستيسر ترجمة هذه المواقع الى الفرنسية والعربية واللغات الأخرى الاتصال. كما

تقيم إدارة البذور والموارد الوراثية النباتية فى منظمة الأغذية والزراعة وصلات مع موقعها على الانترنت لهذا الغرض.

٣-٢ مجموعات العمل الفنية والمنسقين

حدد الاجتماع قضايا محددة لتناقشها مجموعات العمل الفنية والتى سوف تكون أساسا للمنتدى الاستشارى. وسيكون الاشتراك فى مجموعات العمل مفتوحا لأى من المهتمين بذلك من العلماء، المنظمات والمؤسسات ذات الصلة بالموضوع بالإضافة الى الباحثين من القطاع الخاص.

٣-٢-١ دور ووظائف منسقى مجموعات العمل الفنية

تم تحديد مسؤوليات منسقى مجموعات العمل الفنية على أنها:

- وضع وتوجيه الأنشطة المناسبة لمجموعات العمل.
- إعداد ونشر تقارير الإنجازات السنوية لأنشطة مجموعات العمل مع إصدار نشرة علمية مناسبة لكى يتم تضمينها فى النشرة الإخبارية للمنتدى الاستشاري.
- إعداد لقاءات تتعلق بموضوعات فنية خاصة بنشاطات المجموعات.
- إقامة الاتصالات بالوسائل الالكترونية والوسائل الأخرى لتسهيل المشاركة فى المعلومات والاتصالات بين المجموعات.
- إعطاء الأولوية للعمل بمجموعاتهم اعتمادا على الموارد المالية المتاحة وفقا لحاجات الدول الأعضاء.

٣-٢-٢ مجموعات العمل الفنية

تم الاتفاق على تصميم وجدولة أعمال المجموعات الستة على النحو التالى:

أولا: مجموعة العمل المعنية بادارة معلومات البذور ومواد الغرس والموارد الوراثية النباتية

الهدف: تسهيل وتجميع وتبادل المعلومات الخاصة بإنتاج البذور والموارد الوراثية فى منطقة الشرق الأدنى وشمال أفريقيا

النشاط الأول: وضع قاعدة البيانات الإقليمية عن نظم إمداد البذور والموارد الوراثية النباتية القائمة حاليا بالإقليم.

وسائل العمل:

- تصميم وإعداد قائمة حصر لنظم إمداد البذور وأصناف المحاصيل المزروعة حاليا فى المنطقة وذلك على المستوى المحلى.

Copyrighted material

- إنشاء قاعدة بيانات قطرية خاصة بنظم إمداد البذور والموارد الوراثية النباتية المحفوظة أو المستخدمة بواسطة منظمات الأبحاث الزراعية المحلية، ومراكز الأبحاث الزراعية الدولية، والقطاع الخاص فى الإقليم.

النشاط الثاني: إنشاء موقع خاص على الإنترنت ويكون على اتصال بالمواقع ذات الصلة مثل مراكز بحوث المجموعة الاستشارية للبحوث الزراعية والمواقع الأخرى وذلك لضمان تدفق المعلومات من خلال الإنترنت:

وسائل العمل:

- إنشاء موقع على الإنترنت لتسهيل الوصول الى المعلومات من الإنترنت عن البذور والموارد الوراثية للمحاصيل الموجودة حاليا أو المستخدمة فى الإقليم. وسوف تساعد هذه المعلومات على التعريف بنظم البذور وأصناف المحاصيل المزروعة حديثا بواسطة المزارعين فى الإقليم. وسوف تعمل أيضا على الإمداد بالمعلومات الخاصة بأنظمة البذور والمصادر الوراثية للمحاصيل المتاحة أو المستخدمة فى برامج تحسين النبات العامة والخاصة.

ثانيا: مجموعة العمل المعنية بالقواعد والاجراءات الخاصة

الهدف: مساعدة بلدان الاقليم فى تحديث تشريعات وقواعد البذور ومراعاة التغيرات الطارئة فى صناعة البذور وذلك على المستويين المحلى والدولى.

ويتم من خلال ذلك تشجيع التنسيق بين قوانين البذور والتشريعات والمقاييس لتسهيل التجارة فى الإقليم.

وللتمكن من إنجاز هذه المهمة بحيث تنعكس أعمالها على مختلف الوكالات التكنولوجية المشاركة، فقد اقترحت الأنشطة التالية التى تتعامل مع مكونات قوانين البذور والقواعد التنظيمية كلا على حدة.

النشاط الأول: التقييم المبدئى للاحتياجات والأولويات

وسائل العمل

- مراجعة الوضع الحالى لقوانين البذور وقواعدها التنظيمية داخل الإقليم وتحديد الأقسام الجغرافية للإقليم التى يمكن أن يتم فيها وضع إطار عمل رسمي.

- وبناء على هذه المراجعة يتم استطلاع موافقة الدول على المشاركة فى هذا النشاط من حيث المبدأ، ومدى حاجتها لقوانين البذور ومعايير التسجيل للأصناف وقواعد حماية الأصناف.
- تحديد الوكالات والأشخاص الذين يمكنهم العمل كجهة اتصال فى البلدان المشاركة فى كل من الموضوعات المختارة.
- إعداد جدول واقعى ومرتب وفقا للأولويات لتنفيذ النشاطات المقترحة لكل من مجموعات عمل المحاصيل الرئيسية.

النشاط الثاني: إعداد مسودة لقانون البذور

وسائل العمل

- فحص مراجعة القاوانين ومسودات مراجعة القوانين الحالية للدول المشاركة.
- تحقيق الاتساق بين قواعد البذور لتيسير حركة البذور وتبادلها فى الإقليم من خلال وضع نموذج لقانون البذور.
- ترجمة المسودة المقترحة الى العربية وإرسالها للوزارات المشاركة لإبداء الرأى.
- عقد اجتماع للدراسة والموافقة على نموذج قانون البذور وطلب تأييد هذه الموافقة من الحكومات المشتركة.

النشاط الثالث: تعديل وتحديث المواصفات القياسة للحقول الاختبارية والبذور للمحاصيل الرئيسية فى الإقليم.

وسائل العمل

- فحص وتجميع مواصفات الحقول الموجودة والمواصفات القياسية لبذور المحاصيل الرئيسية فى الإقليم.
- إعداد توصيف واقعى لأدنى المقاييس والاجراءات اللازمة كأساس لمسودة إجراءات الاعتماد شبه الإقليمى.
- توزيع المسودة على وكالات تسجيل البذور فى شبه الإقليم لإبداء الرأى واقتراح التعديلات المطلوبة.
- إعداد مسودة اعتماد البذور على المستوى الإقليمى لتقييمها بواسطة الحكومات والوكالات الفنية.

النشاط الرابع: تطوير قوانين الصحة النباتية وتحقيق الاتساق على مستوى الإقليم

وسائل العمل

- تقييم قوانين صحة النبات فى كل بلدان الإقليم وتحديد العقبات التى تواجه تحقيق الاتساق.
- بناء على هذا التقييم وبمساعدة قوية من منظمة الأغذية والزراعة وبخاصة أمانة الاتفاقية الدولية لوقاية النباتات والموافقة المسبقة عن علم وغير ذلك من المنظمات الدولية المهتمة بالصحة النباتية والبذور سوف يتم تحديد النشاطات التى يجب إجراؤها فى الإقليم وذلك لتحسين المواصفات وتسهيل نقل البذور عبر البلدان.

النشاط الخامس: تطوير قانون حماية الأصناف النباتية وفقا لقوانين البذور الحالية

وسائل العمل

- تقييم الوضع الحالى لإجراءات توصيف واعتماد الأصناف ومؤسساتها الموجودة فى البلدان المشاركة.
- مساعدة البلدان فى إعداد نموذج لقانون حماية الأصناف النباتية المبنى على قانون الاتحاد الدولى لحماية الأصناف النباتية الجديدة ١٩٩١، وأيضا نموذج قوانين البذور المذكور فى النشاط الثانى.
- ترجمة هذه الأعمال الى العربية وإعطائها للوزارات المشاركة للتعليق.
- عقد اجتماع للموظفين المعنيين لتقييم إمكانية تطبيق مسودة القانون، والتعاون الإقليمى المحتمل فى مجال اختيار الأصناف.
- إعداد مسودة معدلة للقانون والحصول على تأييد أو موافقة البلدان المشتركة، وخاصة البلدان التى وقعت اتفاقية منظمة التجارة الدولية.

ثالثا: مجموعة العمل المعنية بنقل التكنولوجيا والتدريب

الهدف: *تشجيع إقامة برامج تدريب وتعليم وأبحاث إقليمية عن إنتاج وتكنولوجيا البذور على المستوى الأكاديمى والتقنى العملى. وذلك لتقوية قدرة المزارعين لإنتاج بذور جيدة النوعية.*

النشاط الأول: القيام بمسح لأحدث البحوث والمواد العلمية عن الحبوب لتستخدم فى أنشطة التدريب وكتابة سجل بالإمكانيات المتوافرة لإقامة الدورات التدريبية فى المناطق الرئيسية فى الإقليم.

وسائل العمل

- تصميم وتنفيذ مسح لبرامج التدريب ذات الصلة والمؤسسات التدريبية على المستويين القومى والإقليمى
- تصميم وتنفيذ مسح لأنشطة التدريب غير الرسمية والنشاطات داخل المجتمعات المحلية لتوثيق المعارف والمعلومات المحلية المرتبطة بطرق المزارعين (الرجال أو النساء) فى إنتاج الحبوب ونظم الإدارة.

النشاط الثانى: تطوير السياسة التدريبية المتكاملة التى تلبى احتياجات برامج إنتاج البذور القطرية والتعاون الإقليمى لضمان البذور والتى تشمل جميع المنتفعين والعاملين فى هذا المجال.

وسائل العمل

- تصميم وإقرار برامج تدريبية للبذور تعكس احتياجات تحت الأقاليم الرئيسية والمساهمية الأساسيين فى عمليات قطاع البذور.

النشاط الثالث: وضع منهج لتدريب الفلاح والمجتمعات الريفية مع التركيز على قطاع البذور غير الرسمى.

وسائل العمل

- القيام بتقدير للأدوار الأساسية والمكملة التى يقوم بها الرجال والنساء فى قطاع البذور والتى تؤثر على أمن البذور.

النشاط الرابع: تصميم وتنفيذ آلية لنشر المعلومات وإقامة الشبكات ذات الصلة بالمنهجيات المطبقة على مستوى المزرعة لتحسين البذور وإنتاج المواد النباتية المستخدمة كبذور.

وسائل العمل

- تصميم طرق لتبادل المعلومات الهامة حول إنتاج البذور بين المزارعين، وجمعيات المزارعين، والمجتمعات المحلية، وغير ذلك.
- تصميم طرق للاتصال الناجح مع المزارعين (نساء ورجال) عن تحسين البذور وإنتاج وإدارة المواد النباتية، بما فى ذلك الإكثار والتخزين وتسويق البذور ومواد الإنبات للأصناف المستخدمة.

النشاط الخامس: تطوير المعلومات عن أدوات تكنولوجيا البذور المناسبة والمستخدمة فى المزارع الصغيرة لإنتاج البذور.

وسائل العمل

- تحديد الأدوات المناسبة لتكنولوجيا البذور والمرافق المتاحة على المستوى القطرى وتشجيع إقامة المزارع التوضيحية لاستخدام الآلات الحديثة.

رابعا: مجموعة العمل الخاصة ببذور العلف

الهدف: ***تعزيز إنتاج بذور الأعلاف والمراعى فى المنطقة***

النشاط الأول: **تعريف الآليات الخاصة بإنتاج بذور الأعلاف والمراعى عالية الجودة فى الإقليم وتحقيق الاتساق بينها**

وسائل العمل

- **إجراء حصر شامل للبنية الأساسية للقطاع العام والخاص على المستوى الإقليمى. وتحديد الجهات الخدمية ذات القدرة على إكثار بذور الأصناف المتأقلمة على الأقاليم البيئية الزراعية أو على الظروف الاقتصادية والاجتماعية والتى ينمو تحتها المحاصيل ذات الصلة بالموضوع.**
- **تطوير خطة فعالة لتسهيل إكثار بذور الأعلاف، وبذور محاصيل المراعى.**
- **تصميم دليل لتعزيز التطوير المطلوب لإنتاج بذور الأعلاف على المستوى الإقليمى.**

النشاط الثانى: **تعريف العقبات المشتركة التى تواجه استخدام المصادر الوراثية لبذور العلف فى الإقليم.**

وسائل العمل

- **تحديد محاصيل الأعلاف ذات الأولوية فى عملية إنتاج البذور داخل الإقليم وتطوير الإرشادات اللازمة لاستخدامها عن طريق نظم الإرشاد الزراعى القطرية.**

النشاط الثالث: **تعزيز نظم توزيع بذور الأعلاف، ومحاصيل المراعى المستخدمة فى الإقليم.**

وسائل العمل

- **توفير الإرشادات اللازمة لأنظمة الإرشاد الزراعى القطرية حول البرامج التى يجب إقامتها لمساعدة المزارعين فى تطوير إنتاجية محاصيل المراعى من خلال توفير البذور ذات النوعية الجيدة.**

النشاط الرابع: **وضع إحصائيات موثوق بها عن البيانات والمعلومات الخاصة ببذور الأعلاف والمراعي.**

وسائل العمل

- **تطوير وتحديث قاعدة البيانات المتعلقة بالموارد الوراثية لبذور الأعلاف، إنتاج المحاصيل الرعوية ومتطلباتها من البذور، ويتضمن ذلك أنشطة البحث والمعلومات العلمية الخاصة ببذور الأعلاف ثم نشر المعلومات عن طريق الإنترنت.**

خامسا –مجموعة العمل المعنية بأمن البذور

الهدف: *مساعدة الدول للتغلب على مشكلة نقص البذور فى الظروف العادية وأوضاع الطوارئ*

النشاط الأول: **تصميم برامج وآليات إقليمية وشبه إقليمية وقطرية لإنشاء نظام متطور لتخزين بذور الأصناف المحلية المنهجية والإمداد بها.**

وسائل العمل

- **تحديد برامج وآليات على المستوى القطرى لإمكان الربط بين المساهمين والمنتفعين على المستويات الاقليمية وشبه الاقليمية والقطرية.**
- **إقامة صلة مع مجموعات العمل الفنية لتحقيق الاتساق بين قوانين وقواعد البذور ولتحديد العقبات التى تواجه حركة البذور للأصناف الشائعة فى حالات الكوارث.**
- **تصميم برامج وآليات إقليمية وشبه إقليمية وقطرية لضمان كفاءة استخدام المعلومات المتاحة عن طريق نظم الإنذار المبكر.**
- **إقامة صلة مع المجموعات الفنية الأخرى للمجموعة الاستشارية للبحوث الزراعية.**
- **تحديد الاستراتيجيات الفعالة لإكثار وتوريد البذور فى حالات الكوارث.**

النشاط الثانى: **تجميع معلومات مناسبة لإمكان الاستجابة السريعة فى حالة الكوارث**

وسائل العمل

- **معرفة أفضليات المستهلكين المحليين وبيانات أخرى تتعلق بالموضوعات الاجتماعية والاقتصادية.**
- **تجميع معلومات عن المحاصيل الرئيسية والأصناف وأنظمة الزراعة فى الإقليم التى تتأثر بظروف النكبات والكوارث ومخزون البذور المتاحة من الأصناف الشائعة والمستخدمة.**
- **تحديد الآليات التى تمكن من وصل الموزعين مع المساهمين والمنتفعين الآخرين على المستويات الإقليمية وتحت الإقليمية والقومية وذلك لتوفير مخزون بذور مناسب.**

سادسا: مجموعة العمل المعنية ببذور البساتين: (الخضر، والفاكهة ومحاصيل الزينة والمحاصيل الطبية)

الهدف: ***تقديم التطوير المطلوب فى إنتاج بذور ومواد الإكثار لبذور البساتين على المستوى المحلى والإقليمى.***

النشاط الأول: **تحديد الاستراتيجيات والآليات لتنمية البذور البستانية وإنتاج مواد الإكثار فى الإقليم.**

وسائل العمل

- **تحديد محاصيل الخضر الجديرة بالاستثمار وتطوير السياسات القطرية لتسهيل إنتاج بذور الخضر بواسطة المزارعين.**

- تطوير البرامج الخاصة بتحسين إنتاج وتسويق بذور الخضر على المستويين القطرى والإقليمى بصورة مستدامة.
- حفظ بيانات عن المنظمات والهيئات العاملة في إنتاج بذور الخضر فى دول الإقليم.

النشاط الثاني: إقامة وتحديث قاعدة البيانات المتعلقة بإنتاج بذور الخضر فى دول الإقليم.

وسائل العمل:

- تطوير وحفظ قاعدة البيانات المناسبة المتعلقة بإنتاج محاصيل الخضر والاحتياجات من البذور ومدى توافرها على المستوى المحلى بالإضافة الى نشاطات الأبحاث عن بذور الخضر. نشر المعلومات عن طريق شبكة الإنترنت.

٣-٢-٣ المنسقون

لجنة التنسيق المؤقتة

المنسق: السيد/ أيمن فريد أبو حديد
أستاذ العلوم البستانية
كلية الزراعة جامعة عين شمس
القاهرة، مصر

منسقو مجموعات العمل:

مجموعة العمل الأولى: ادارة معلومات البذور ومواد الغرس والموارد الوراثية النباتية

المنسق: السيد/عدنان عبد النور
رئيس قسم الانتاج النباتى
بوزارة الزراعة
عمان، الأردن

مجموعة العمل الثانية: القواعد والاجراءات الخاصة بالبذور

المنسق: السيد/مايكل تيرنر
رئيس وحدة البذور بالمركز الدولى للبحوث الزراعية فى المناطق الجافة
حلب، سوريا

Copyrighted material

رئيس وحدة البذور بالمركز الدولى للبحوث الزراعية فى
المناطق الجافة
حلب، سوريا

مجموعة العمل الثالثة: نقل التكنولوجيا والتدريب

المنسق: السيد/مجيد ديجهان شوار
أستاذ مساعد تكنولوجيا البذور ورئيس قسم
تكنولوجيا البذور
الإدارة العامة للمؤسسات الدولية والإقليمية
وزارة الزراعة والتكنولوجيا
طهران، جمهورية إيران الإسلامية

مجموعة العمل الرابعة: بذور العلف

المنسق: السيد/محمد تازي
مدير مركز إنتاج بذور العلف
الجديدة، المغرب

مجموعة العمل الخامسة: أمن البذور

المنسق: السيد/ شحادة بجاني
رئيس مصلحة الاستيراد والتصدير
وزارة الزراعة
لبنان

مجموعة العمل السادسة: بذور البساتين: (الخضر، والفاكهة، ومحاصيل
الزينة، والمحاصيل الطبية)

المنسق: السيد/أيمن أبو حديد
أستاذ البساتين
كلية الزراعة جامعة عين شمس
القاهرة، مصر

FAO TECHNICAL PAPERS

FAO PLANT PRODUCTION AND PROTECTION PAPERS

1 Horticulture: a select bibliography, 1978 (E)
2 Cotton specialists and research institutions in selected countries, 1976 (E)
3 Food legumes: distribution, adaptability and biology of yield, 1977 (E F S)
4 Soybean production in the tropics, 1977 (C E F S)
4 Rev.1 Soybean production in the tropics (first revision), 1982 (E)
5 Les systèmes pastoraux sahéliens, 1977 (F)
6 Pest resistance to pesticides and crop loss assessment – Vol. 1, 1977 (E F S)
6/2 Pest resistance to pesticides and crop loss assessment – Vol. 2, 1979 (E F S)
6/3 Pest resistance to pesticides and crop loss assessment – Vol. 3, 1981 (E F S)
7 Rodent pest biology and control – Bibliography 1970-74, 1977 (E)
8 Tropical pasture seed production, 1979 (E F** S**)
9 Food legume crops: improvement and production, 1977 (E)
10 Pesticide residues in food, 1977 – Report, 1978 (E F S)
10 Rev. Pesticide residues in food 1977 – Report, 1978 (E)
10 Sup. Pesticide residues in food 1977 – Evaluations, 1978 (E)
11 Pesticide residues in food 1965-78 – Index and summary, 1978 (E F S)
12 Crop calendars, 1978 (E/F/S)
13 The use of FAO specifications for plant protection products, 1979 (E F S)
14 Guidelines for integrated control of rice insect pests, 1979 (Ar C E F S)
15 Pesticide residues in food 1978 – Report, 1979 (E F S)
15 Sup. Pesticide residues in food 1978 – Evaluations, 1979 (E)
16 Rodenticides: analyses, specifications, formulations, 1979 (E F S)
17 Agrometeorological crop monitoring and forecasting, 1979 (C E F S)
18 Guidelines for integrated control of maize pests, 1979 (C E)
19 Elements of integrated control of sorghum pests, 1979 (E F S)
20 Pesticide residues in food 1979 – Report, 1980 (E F S)
20 Sup. Pesticide residues in food 1979 – Evaluations, 1980 (E)
21 Recommended methods for measurement of pest resistance to pesticides, 1980 (E F)
22 China: multiple cropping and related crop production technology, 1980 (E)
23 China: development of olive production, 1980 (E)
24/1 Improvement and production of maize, sorghum and millet – Vol. 1. General principles, 1980 (E F)
24/2 Improvement and production of maize, sorghum and millet – Vol. 2. Breeding, agronomy and seed production, 1980 (E F)
25 *Prosopis tamarugo:* fodder tree for arid zones, 1981 (E F S)
26 Pesticide residues in food 1980 – Report, 1981 (E F S)
26 Sup. Pesticide residues in food 1980 – Evaluations, 1981 (E)
27 Small-scale cash crop farming in South Asia, 1981 (E)
28 Second expert consultation on environmental criteria for registration of pesticides, 1981 (E F S)
29 Sesame: status and improvement, 1981 (E)
30 Palm tissue culture, 1981 (C E)
31 An eco-climatic classification of intertropical Africa, 1981 (E)
32 Weeds in tropical crops: selected abstracts, 1981 (E)
32 Sup 1 Weeds in tropical crops: review of abstracts, 1982 (E)
33 Plant collecting and herbarium development, 1981 (E)
34 Improvement of nutritional quality of food crops, 1981 (C E)
35 Date production and protection, 1982 (Ar E)
36 El cultivo y la utilización del tarwi – *Lupinus mutabilis* Sweet, 1982 (S)
37 Pesticide residues in food 1981 – Report, 1982 (E F S)
38 Winged bean production in the tropics, 1982 (E)
39 Seeds, 1982 (E/F/S)
40 Rodent control in agriculture, 1982 (Ar C E F S)
41 Rice development and rainfed rice production, 1982 (E)
42 Pesticide residues in food 1981 – Evaluations, 1982 (E)
43 Manual on mushroom cultivation, 1983 (E F)
44 Improving weed management, 1984 (E F S)
45 Pocket computers in agrometeorology, 1983 (E)
46 Pesticide residues in food 1982 – Report, 1983 (E F S)
47 The sago palm, 1983 (E F)
48 Guidelines for integrated control of cotton pests, 1983 (Ar E F S)
49 Pesticide residues in food 1982 – Evaluations, 1983 (E)
50 International plant quarantine treatment manual, 1983 (C E)
51 Handbook on jute, 1983 (E)
52 The palmyrah palm: potential and perspectives, 1983 (E)
53/1 Selected medicinal plants, 1983 (E)
54 Manual of fumigation for insect control, 1984 (C E F S)
55 Breeding for durable disease and pest resistance, 1984 (C E)
56 Pesticide residues in food 1983 – Report, 1984 (E F S)
57 Coconut, tree of life, 1984 (E S)
58 Economic guidelines for crop pest control, 1984 (E F S)
59 Micropropagation of selected rootcrops, palms, citrus and ornamental species, 1984 (E)
60 Minimum requirements for receiving and maintaining tissue culture propagating material, 1985 (E F S)
61 Pesticide residues in food 1983 – Evaluations, 1985 (E)
62 Pesticide residues in food 1984 – Report, 1985 (E F S)
63 Manual of pest control for food security reserve grain stocks, 1985 (C E)
64 Contribution à l'ecologie des aphides africains, 1985 (F)
65 Amélioration de la culture irriguée du riz des petits fermiers, 1985 (F)
66 Sesame and safflower: status and potentials, 1985 (E)
67 Pesticide residues in food 1984 – Evaluations, 1985 (E)
68 Pesticide residues in food 1985 – Report, 1986 (E F S)
69 Breeding for horizontal resistance to wheat diseases, 1986 (E)
70 Breeding for durable resistance in perennial crops, 1986 (E)

71 Technical guideline on seed potato micropropagation and multiplication, 1986 (E)
72/1 Pesticide residues in food 1985 – Evaluations – Part I: Residues, 1986 (E)
72/2 Pesticide residues in food 1985 – Evaluations – Part II: Toxicology, 1988 (E)
73 Early agrometeorological crop yield assessment, 1988 (E F S)
74 Ecology and control of perennial weeds in Latin America, 1986 (E S)
75 Technical guidelines for field variety trials, 1993 (E F S)
76 Guidelines for seed exchange and plant introduction in tropical crops, 1986 (E)
77 Pesticide residues in food 1986 – Report, 1986 (E F S)
78 Pesticide residues in food 1986 – Evaluations – Part I: Residues, 1986 (E)
78/2 Pesticide residues in food 1986 – Evaluations – Part II: Toxicology, 1987 (E)
79 Tissue culture of selected tropical fruit plants, 1987 (E)
80 Improved weed management in the Near East, 1987 (E)
81 Weed science and weed control in Southeast Asia, 1987 (E)
82 Hybrid seed production of selected cereal, oil and vegetable crops, 1987 (E)
83 Litchi cultivation, 1989 (E S)
84 Pesticide residues in food 1987 – Report, 1987 (E F S)
85 Manual on the development and use of FAO specifications for plant protection products, 1987 (E** F S)
86/1 Pesticide residues in food 1987 – Evaluations – Part I: Residues, 1988 (E)
86/2 Pesticide residues in food 1987 – Evaluations – Part II: Toxicology, 1988 (E)
87 Root and tuber crops, plantains and bananas in developing countries – challenges and opportunities, 1988 (E)
88 *Jessenia* and *Oenocarpus*: neotropical oil palms worthy of domestication, 1988 (E S)
89 Vegetable production under arid and semi-arid conditions in tropical Africa, 1988 (E F)
90 Protected cultivation in the Mediterranean climate, 1990 (E F)
91 Pastures and cattle under coconuts, 1988 (E S)
92 Pesticide residues in food 1988 – Report, 1988 (E F S)
93/1 Pesticide residues in food 1988 – Evaluations – Part I: Residues, 1988 (E)
93/2 Pesticide residues in food 1988 – Evaluations – Part II: Toxicology, 1989 (E)
94 Utilization of genetic resources: suitable approaches, agronomical evaluation and use, 1989 (E)
95 Rodent pests and their control in the Near East, 1989 (E)
96 *Striga* – Improved management in Africa, 1989 (E)
97/1 Fodders for the Near East: alfalfa, 1989 (Ar E)
97/2 Fodders for the Near East: annual medic pastures, 1989 (Ar E F)
98 An annotated bibliography on rodent research in Latin America 1960-1985, 1989 (E)
99 Pesticide residues in food 1989 – Report, 1989 (E F S)
100 Pesticide residues in food 1989 – Evaluations – Part I: Residues, 1990 (E)
100/2 Pesticide residues in food 1989 – Evaluations – Part II: Toxicology, 1990 (E)
101 Soilless culture for horticultural crop production, 1990 (E)
102 Pesticide residues in food 1990 – Report, 1990 (E F S)
103/1 Pesticide residues in food 1990 – Evaluations – Part I: Residues, 1990 (E)
104 Major weeds of the Near East, 1991 (E)
105 Fundamentos teórico-prácticos del cultivo de tejidos vegetales, 1990 (S)
106 Technical guidelines for mushroom growing in the tropics, 1990 (E)
107 *Gynandropsis gynandra* (L.) Briq. – a tropical leafy vegetable – its cultivation and utilization, 1991 (E)
108 Carambola cultivation, 1993 (E S)
109 Soil solarization, 1991 (E)
110 Potato production and consumption in developing countries, 1991 (E)
111 Pesticide residues in food 1991 – Report, 1991 (E)
112 Cocoa pest and disease management in Southeast Asia and Australasia, 1992 (E)
113/1 Pesticide residues in food 1991 – Evaluations – Part I: Residues, 1991 (E)
114 Integrated pest management for protected vegetable cultivation in the Near East, 1992 (E)
115 Olive pests and their control in the Near East, 1992 (E)
116 Pesticide residues in food 1992 – Report, 1993 (E F S)
117 Quality declared seed, 1993 (E F S)
118 Pesticide residues in food 1992 – Evaluations – Part I: Residues, 1993 (E)
119 Quarantine for seed, 1993 (E)
120 Weed management for developing countries, 1993 (E S)
121 Rambutan cultivation, 1993 (E)
122 Pesticide residues in food 1993 – Report, 1993 (E F S)
123 Rodent pest management in eastern Africa, 1994 (E)
124 Pesticide residues in food 1993 – Evaluations – Part I: Residues, 1994 (E)
125 Plant quarantine: theory and practice, 1994 (Ar)
126 Tropical root and tuber crops – Production, perspectives and future prospects, 1994 (E)
127 Pesticide residues in food 1994 – Report, 1994 (E)
128 Manual on the development and use of FAO specifications for plant protection products – Fourth edition, 1995 (E F S)
129 Mangosteen cultivation, 1995 (E)
130 Post-harvest deterioration of cassava – A biotechnology perspective, 1995 (E)
131/1 Pesticide residues in food 1994 – Evaluations – Part I: Residues, Volume 1, 1995 (E)
131/2 Pesticide residues in food 1994 – Evaluations – Part I: Residues, Volume 2, 1995 (E)
132 Agro-ecology, cultivation and uses of cactus pear, 1995 (E)
133 Pesticide residues in food 1995 – Report, 1996 (E)
134 (Number not assigned)
135 Citrus pest problems and their control in the Near East, 1996 (E)
136 El pepino dulce y su cultivo, 1996 (S)
137 Pesticide residues in food 1995 – Evaluations – Part I: Residues, 1996 (E)
138 Sunn pests and their control in the Near East, 1996 (E)
139 Weed management in rice, 1996 (E)
140 Pesticide residues in food 1996 – Report, 1997 (E)
141 Cotton pests and their control in the Near East, 1997 (E)
142 Pesticide residues in food 1996 – Evaluations – Part I: Residues, 1997 (E)

143 Management of the whitefly-virus complex, 1997 (E)
144 Plant nematode problems and their control in the Near East region, 1997 (E)
145 Pesticide residues in food 1997 – Report, 1998 (E)
146 Pesticide residues in food 1997 – Evaluations – Part I: Residues, 1998 (E)
147 Soil solarization and integrated management of soilborne pests, 1998 (E)
148 Pesticide residues in food 1998 – Report, 1999 (E)
149 Manual on the development and use of FAO specifications for plant protection products – Fifth edition, including the new procedure, 1999 (E)
150 Restoring farmers' seed systems in disaster situations, 1999 (E)
151 Seed policy and programmes for sub-Saharan Africa, 1999 (E F)
152/1 Pesticide residues in food 1998 – Evaluations – Part I: Residues, Volume 1, 1999 (E)
152/2 Pesticide residues in food 1998 – Evaluations – Part I: Residues, Volume 2, 1999 (E)
153 Pesticide residues in food 1999 – Report, 1999 (E)
154 Greenhouses and shelter structures for tropical regions, 1999 (E)
155 Vegetable seedling production manual, 1999 (E)
156 Date palm cultivation, 1999 (E)
157 Pesticide residues in food 1999 – Evaluations – Part I: Residues, 2000 (E)
158 Ornamental plant propagation in the tropics, 2000 (E)
159 Seed policy and programmes in the Near East and North Africa, 2000

Availability: August 2000

Ar – Arabic
C – Chinese
E – English
F – French
P – Portuguese
S – Spanish

Multil – Multilingual
* Out of print
** In preparation

The FAO Technical Papers are available through the authorized FAO Sales Agents or directly from Sales and Marketing Group, FAO, Viale delle Terme di Caracalla, 00100 Rome, Italy.

Copyrighted material

This publication presents the proceedings of the Regional Technical Meeting on Seed Policy and Programmes in the Near East and North Africa, held in Larnaca, Cyprus from 27 June to 2 July 1999. The meeting was organized and implemented by the Agricultural Research Institute in Nicosia, Cyprus in close collaboration with the Seed and Plant Genetic Resources Service of the Food and Agriculture Organization of the United Nations. In line with the Rome Declaration on World Food Security and the World Food Summit Plan of Action, the meeting recognized that one of the major challenges facing most countries in the Near East and North Africa is the need to invest significant resources in strengthening their capacity to increase the availability of good quality seeds of a wider range of plant varieties. This will contribute to the maximization of both agrobiodiversity and productivity, in order to achieve national food security while reducing environmental degradation and the depletion of natural resources. The meeting proposed and agreed to establish a Regional Consultative Forum on Seed Policy and Programmes for the Near East and North Africa (CFS-NENA). The forum will facilitate intercountry scientific and technical collaboration on seed production and supply, and promote crop genetic resources evaluation, conservation and utilization in the Near East and North Africa.

ISBN 92-5-104473-2
ISSN 0259-2517
9 789251 044735
TC/M/X8076E/1/9.00/1200